THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCIII. No. 2230.] LONDON, FEBRUARY 6, 1906. [58TH YEAR. PRICE 6d.

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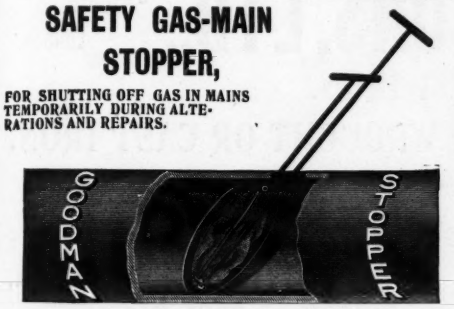

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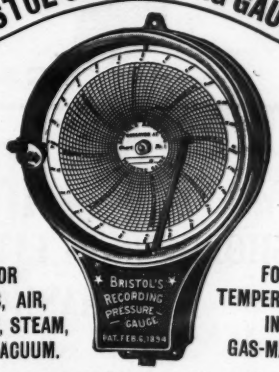

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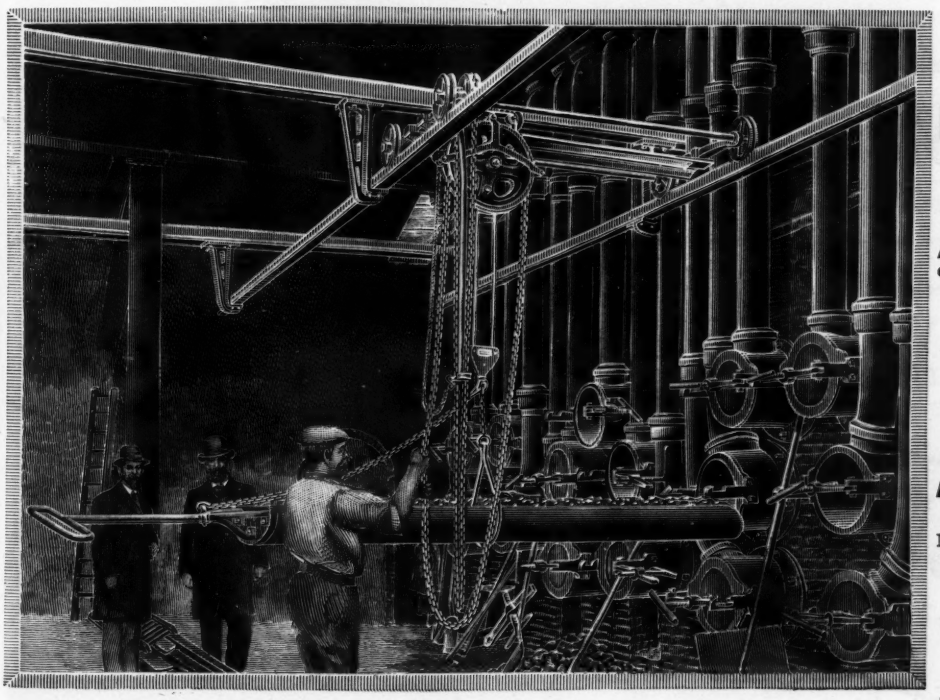

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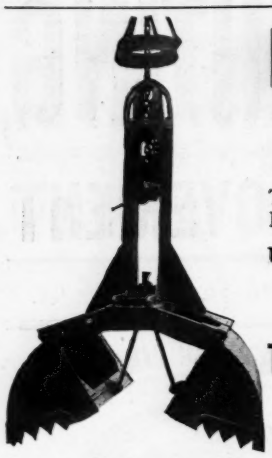

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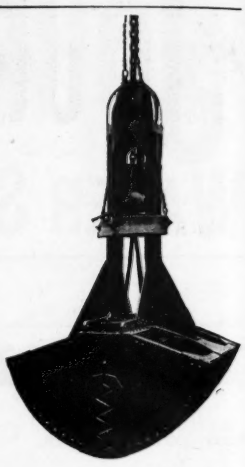

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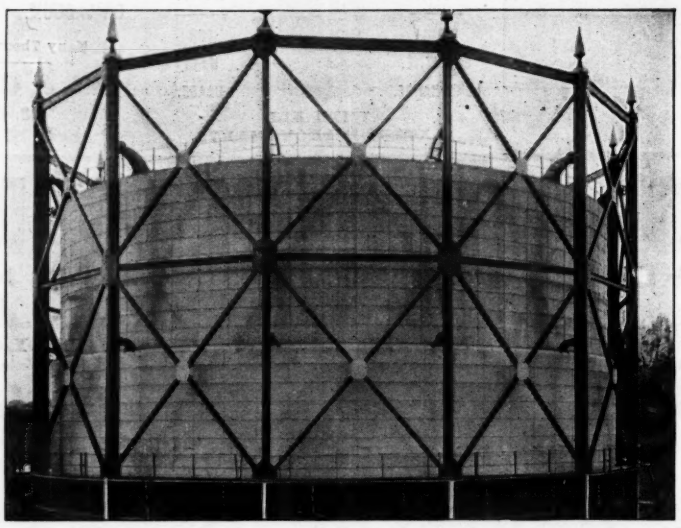

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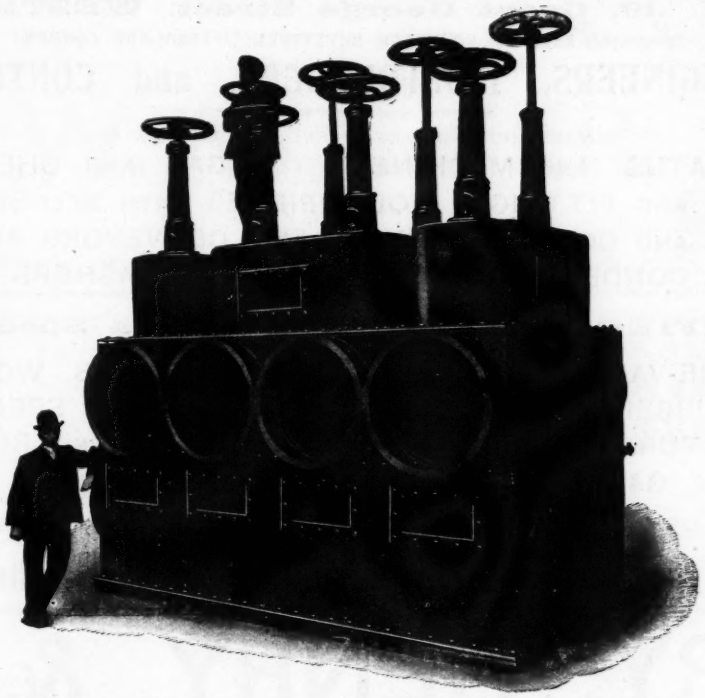

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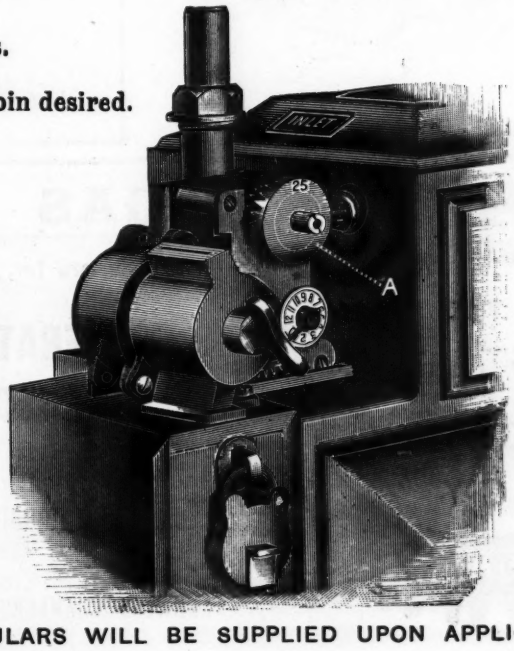

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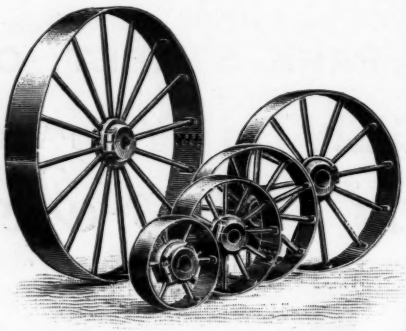

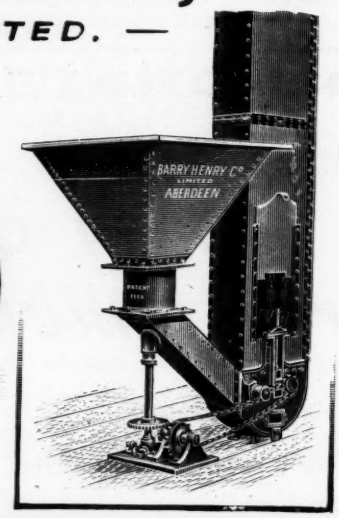

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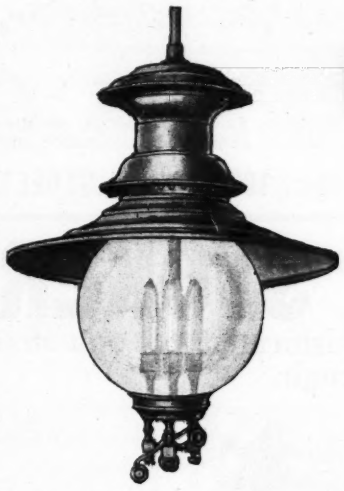

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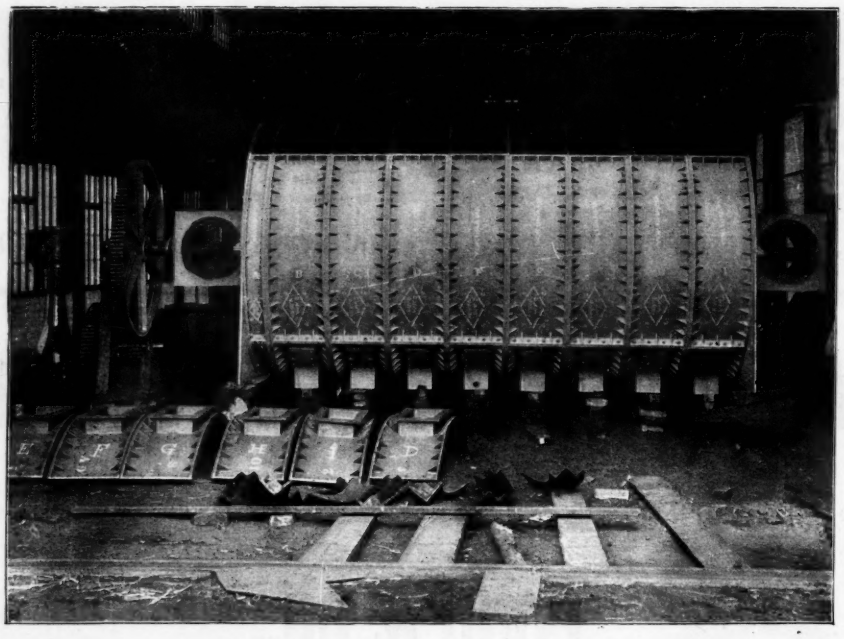

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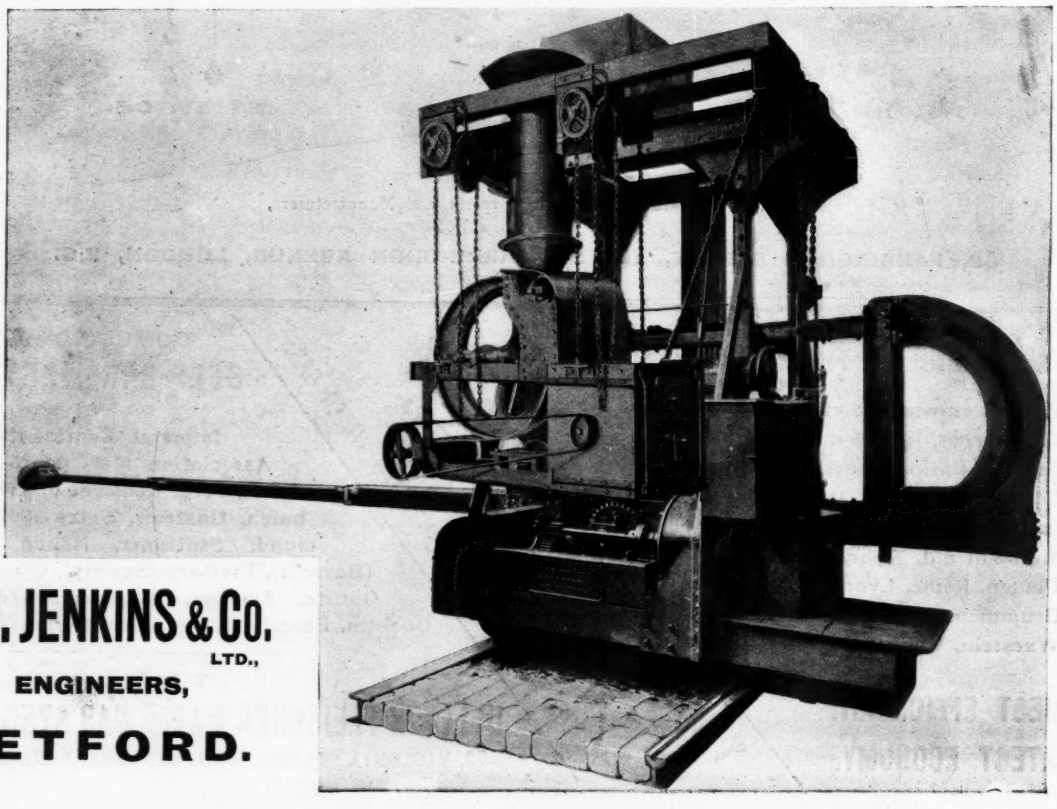

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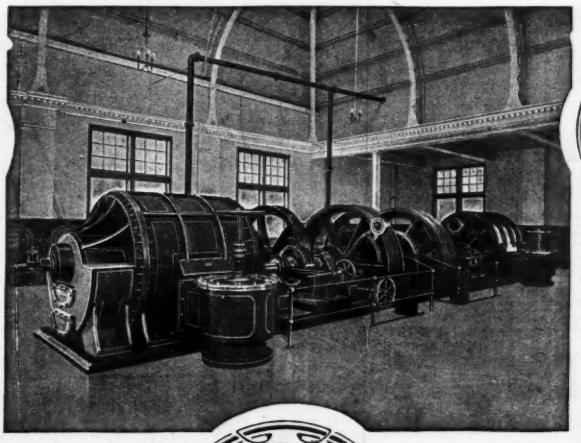

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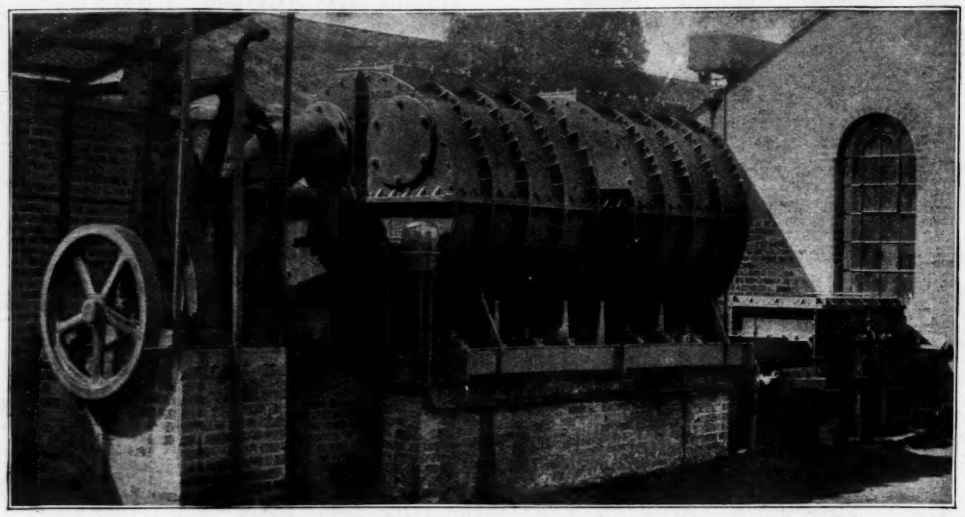

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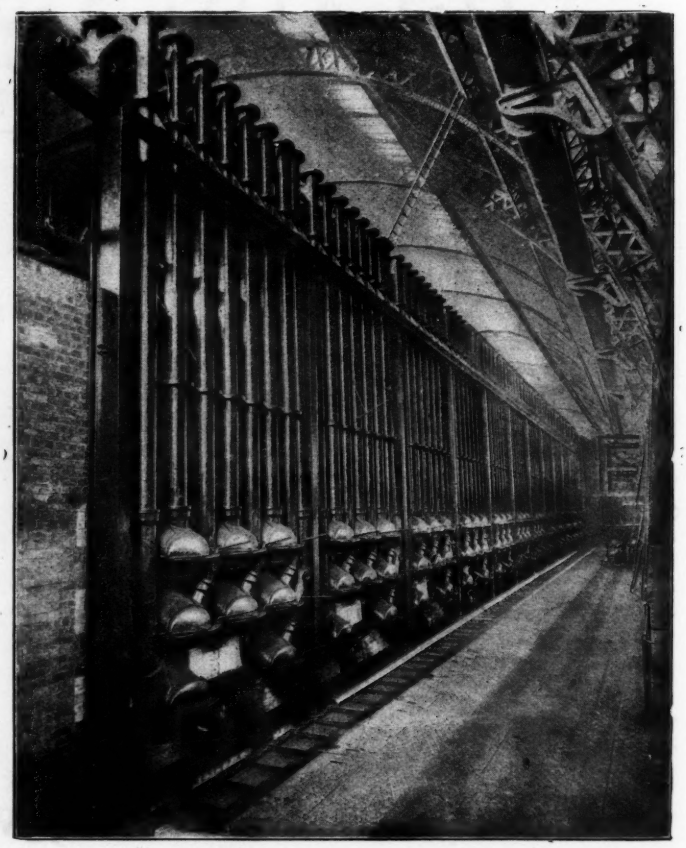

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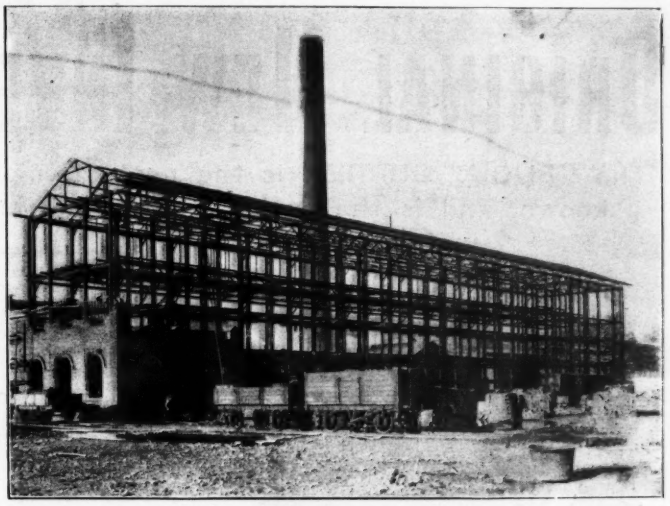

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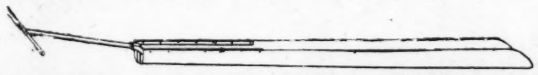

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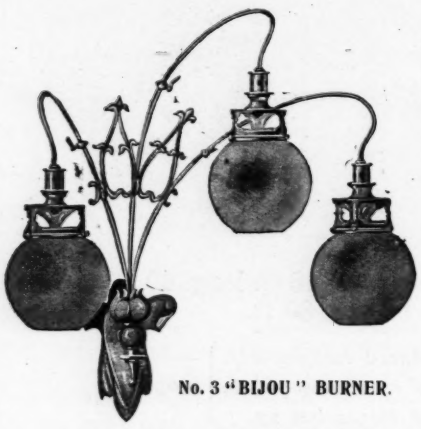

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	Cubic Feet Daily.		Cubic Feet Daily.		Cubic Feet Daily.
Aarhus, Denmark	800,000	G. L. & C. Co., Beckton	2,250,000	Redhill	275,000
Antwerp, Belgium	1,500,000	G. L. & C. Co., „ (2nd)	10,750,000	Redhill (Second)	300,000
Aylesbury	150,000	G. L. & C. Co., Bromley	3,750,000	Reichenberg, Bohemia	200,000
Barrow	300,000	G. L. & C. Co., Fulham	1,750,000	Romford	300,000
Bath	1,000,000	G. L. & C. Co., Nine Elms	2,750,000	Rotterdam, Holland	850,000
Belfast	1,700,000	Geneva, Switz.	500,000	Rotterdam, Holland (Second)	1,500,000
Belfast (Second)	4,500,000	Gosport	200,000	Rotterdam, Holland (Third)	750,000
Birmingham	1,500,000	Göteborg, Sweden	300,000	St. Gallen, Switz.	225,000
Bordentown, N.J.	125,000	Guildford	350,000	St. Joseph, Mo.	750,000
Bournemouth	1,000,000	Hamburg, Germany	1,750,000	Santiago de Cuba	400,000
Bremen, Germany	550,000	Hartlepool	750,000	Scarborough	800,000
Bremen, Germany (Second)	950,000	Hebden Bridge	200,000	Shanghai	225,000
Brentford	1,200,000	Heidelberg, Germany	200,000	Shanghai (Second)	225,000
Bridlington	150,000	Holyoke, Mass.	600,000	Southampton	800,000
Bridlington (Second)	200,000	Hull	1,500,000	Southampton (Second)	500,000
Brighton	1,750,000	L. & N.W. Rly., Crewe	700,000	Southgate	400,000
Brighton (Second)	1,850,000	Lawrence, Mass.	400,000	Southport	750,000
Brussels—Forest	1,000,000	Lea Bridge	350,000	Southport (Second)	900,000
Brussels—Ville	750,000	Lea Bridge (Second)	350,000	Stafford	500,000
Brussels—Ville (Second)	750,000	Liége, Belgium	1,000,000	Staines	600,000
Brussels—Ville (Third)	1,500,000	Lincoln	500,000	Stockport	600,000
Carlisle	600,000	Liverpool	3,500,000	Stockport (Second)	600,000
Chorley	300,000	Liverpool (Second)	4,500,000	Stockton-on-Tees	500,000
Commercial Gas Co.	850,000	Longton	600,000	Swansea	750,000
Commercial (Second)	850,000	Magdeburg, Germany	1,400,000	Swansea (Second)	1,000,000
Commercial (Third)	1,250,000	Maidenhead	225,000	Sydney—Harbour	500,000
Commercial (Fourth)	2,000,000	Maidenhead (Second)	225,000	Sydney—Harbour (Second)	500,000
Copenhagen	700,000	Malta	400,000	Sydney—Mortlake	500,000
Copenhagen (Second)	2,500,000	Manchester	3,500,000	Sydney—Mortlake (Second)	500,000
Coventry	600,000	Manchester (Second)	3,500,000	Syracuse, N.Y.	850,000
Coventry (Second)	600,000	McKeesport, Pa.	500,000	Taunton	225,000
Croydon	1,250,000	Merthyr Tydfil	300,000	The Hague, Holland	1,000,000
Croydon (Second)	625,000	Middlesbrough	1,250,000	Tilburg, Holland	400,000
Croydon (Third)	625,000	Newburgh, N.Y.	350,000	Tottenham	750,000
Deventer, Holland	150,000	Newburgh (Second)	250,000	Tottenham (Second)	750,000
Deventer, Holland (Second)	200,000	New York	1,200,000	Tottenham (Third)	350,000
Dorking	150,000	New York	4,000,000	Tottenham (Fourth)	1,000,000
Dublin	2,000,000	North Middlesex	150,000	Tunbridge Wells	1,000,000
Dublin (Second)	2,000,000	North Middlesex (Second)	200,000	Utrecht, Holland	1,000,000
Dunedin, N.Z.	150,000	Norwich	1,000,000	Utrecht, Holland (Second)	1,000,000
Dunedin, N.Z. (Second)	275,000	Ostend, Belgium	100,000	Waltham	400,000
Durham	200,000	Perth, W.A.	125,000	Wandsworth & Putney	1,800,000
Eastbourne	1,250,000	Port Elizabeth, S.A.	400,000	Watford	300,000
Edinburgh	2,000,000	Portsmouth	1,000,000	Watford (Second)	350,000
Epsom	225,000	Posen, Germany	450,000	West Ham	1,500,000
Falmouth	150,000	Posen, Germany (Second)	700,000	Winchester	225,000
Faversham	200,000	Preston	1,400,000	Zwolle, Holland	200,000

AND WORK UNDERTAKEN SINCE JANUARY 1, 1904.

Taunton (2nd)	350,000	West Ham (2nd)	800,000	Alkmaar, Holland	400,000
Bognor	100,000	Brieg, Silesia	100,000	Leiden, Holland	500,000
Bournemouth (2nd)	500,000	Brussels—Ville (4th)	350,000	Poole	1,500,000
Vienna	3,500,000	Innsbruck, Austria	200,000	Berlin-Rixdorf	650,000
Maastricht, Holland	200,000	Marlborough	100,000	Berlin-Charlottenburg	2,500,000
Antwerp, Belgium (2nd)	1,000,000	Flensburg, Sleswig	300,000	Bochum, Westphalia	530,000
Tottenham (5th)	1,000,000	Weston-super-Mare	300,000	Brussels–Anderlecht	350,000
The Hague, Holland (2nd)	500,000	Wexford, Ireland	100,000	Leigh, Lancs.	350,000
Hampton Court	500,000	Budapest, Hungary	50,000	Stockport (3rd)	400,000
Lea Bridge (3rd)	400,000	Swindon	300,000	Agram, Croatia	200,000
Dublin (3rd)	650,000	Reading	1,000,000	Bruges, Belgium	200,000
North Middlesex (3rd)	75,000	Oberhausen, Germany	175,000	Liége, Belgium (2nd)	750,000
St. Gallen, Switz. (2nd)	225,000	Malmo, Sweden	350,000	Lemberg, Galicia	260,000
Brussels—St. Josse	1,000,000	Ipswich	750,000	Leeuwarden, Holland	400,000
Dundee	1,500,000	Winchester (2nd)	125,000	Stockholm	1,500,000
Bridgwater	200,000	Zwolle, Holland (2nd)	200,000	Romford (2nd)	350,000

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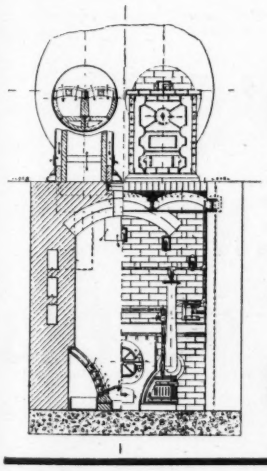

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VOL. XCIII., No. 2230.—TUESDAY, FEBRUARY 6, 1906.

EDITORIAL NOTES—GAS, &c.

Meeting of the Gaslight and Coke Company—Death of Sir William Makins.

THE half-yearly meeting of the Gaslight and Coke Company on Friday, which promised to be one of but an ordinary character, proved, on the contrary, to be of exceptional interest—not to say importance. In the regrettable absence through illness of the Governor, Sir William T. Makins, Bart.—an illness which immediately after the meeting all were inexpressibly grieved and shocked to learn had terminated in death—Mr. Corbet Woodall occupied the chair, in virtue of the position to which his colleagues had called him of Acting-Governor during the leave of absence (if so it may be put) of Sir William. Mr. Woodall's opening remarks were pregnant with his intense feeling with regard to the circumstances which had placed him in that position; and it may be mentioned here that, in proposing the re-election of Sir William as a Director, which it became his duty to do later in the proceedings, he paid a well-merited tribute to the whole-hearted devotion of the late Governor to the affairs of the Company, and his toleration of, and courtesy towards, all who might happen to differ from him. We ourselves have, on many occasions, felt constrained to criticize the actions and policy of the Company, of which the late Governor was the exponent, but have never failed to recognize and appreciate his honesty of purpose and fidelity to principles and tradition. The great and eminent services which he rendered to the Company are beyond question, and will be gratefully held in remembrance. We need say nothing more in this particular place; as Sir William's connection with the gas industry is traced in a special article elsewhere. His removal renders vacant the highest office in this, the largest gas undertaking in the world, and in the history of which undertaking is written the commencement of gas supply. It is a proud and distinguished office; and upon the shoulders of whoever succeeds to it will rest responsibility and care to bear which few are equal, though many may feel competent to do so.

We have now to turn to the business which engaged the proprietors. This is the first occasion on which Mr. Woodall has been called upon to occupy the chair at a meeting of the Company; and it goes without saying that the proprietors found in him a master of both position and subject. The first portion of his statement was devoted to a candid explanation of the deficiency in net revenue to meet the dividend; and, by so doing, he to a certain extent disarmed criticism. The shareholders were not, however, put quite at their ease by his explanation that a deficiency had really been expected. There is no doubt that to the ordinary shareholder a continually recurring deficiency is disquieting, unless he can be assured that the end is in sight. With regard to this, it is satisfactory that the Chairman, in concluding his speech, expressed himself as being very hopeful as to the future of the Company; and his confidence is wholly justified in so far as it has been inspired by the exertions of its present officers, who, by all accounts, are working heartily and zealously for its interests. Mr. Woodall probably also counted on some relief in the cost of manufacture from the working of the London Gas Act of 1905, only recently put into operation. On the other side, however, there is the prospect of dearer coal in the immediate future; and an advance to anything like the rates which prevailed only a few years ago may upset the most careful calculation. Some interesting figures were quoted as supplementing the statement of accounts, from which it appears that the wear and tear account for the half year has been debited with more than £14,000 for plant abandoned; and also that fully £200,000 has been spent out of revenue during the last six years in reconstruction of the works and plant. This has resulted in an increase to the productive capacity of more than 10 million cubic feet per day, and has enabled the Company to concentrate production where it can be carried on most economically. All this is excellent, since it makes for the future prosperity of the undertaking.

Very suitable reference was made by the Chairman to the displacement in the Company's district of electricity by incandescent lighting—notably at Broad Street Railway Station, where 8000-candle power electric lighting, costing annually £1017, has been displaced by five times the candle power given by incandescent gas-burners, at an estimated annual cost of £706. These are figures that "talk;" and it cannot but do good to the gas industry to proclaim them from the housetop. Fitting allusion was made to the special services rendered by the General Manager (Mr. D. Milne Watson) and the Accountant (Mr. Bevis) in obtaining a reduction in the rateable value of the Company's property; after which the Chairman plunged, almost precipitately, into the question of meter-rents. The impression made by his remarks in this connection was that he advocated a change of policy in this respect, though it presently appeared that his object was to enforce the necessity of bearing in mind the free meters, as also the higher quality of gas supplied by the Company, when speaking of the price of gas. That these two matters do place the Company at a disadvantage when comparisons are made by "the man in the street," is not to be denied; but they are neither of them irremediable. As to the question of illuminating power, there is perhaps little to be said at present, or at least until all parties have settled down to the use of the new burner, and further experience has been gained with the calorimeter. But the mere possibility of a return to meter-rents seemed to find but little favour—one proprietor deprecating it as a reactionary policy. Moreover, from the proprietors' point of view, it is not easy to see how anything is now to be gained by it, since in all probability it would mean a reduction of 1d. in the standard price. It will be remembered by many that in the year 1903 the present standard price of 3s. 4d. was agreed to by the London County Council, "in view of the policy of the Company "not to charge meter-rents, and of the assurance of the Com-"pany that they have no intention of varying their practice "in this respect."

Among other points, heavy motor traffic is, it seems, responsible for an enormous increase in the number of broken mains and drawn joints, which are not only a public danger, but involve the Company in very considerable expense. A graceful acknowledgment on the part of the Directors was made of the important part played by Sir George Livesey in securing the passing of the Act of 1905. This had special reference to the relief afforded by the Act with regard to sulphur restrictions and other cognate matters, to obtain which Sir George has worked heart and soul. It may be said, without any fear of contradiction, that to him and him alone is due the freedom which the London Companies now enjoy from the obnoxious restrictions which weighed so heavily upon them for many years.

The South Metropolitan Company's Report.

INFORMATIVE as usual, this report of the Directors of the South Metropolitan Gas Company (which report, with the statement of accounts for the half year, will be found in other columns) is transparently clear as to the present position of the undertaking—whether as regards dividend earned, policy towards consumers and the public, or domestic concerns. To proprietors who look with something like dismay upon the gradual depletion of reserves in what may be termed a period of profound industrial peace, it must at least be comforting to know that the deficiency in net profit available for dividend has been reduced by nearly one-half what it was twelve months ago. At the same time, however, the balance to be carried forward to next half year is reduced to £5683, which implies at any rate the prospect of having to draw upon the reserve fund for future dividends. Fortunately, this stands at a very respectable figure; and

the wonderful vitality possessed by the Company will, it is to be hoped, enable them to tide over the period of low prices for residuals, through which the industry is passing, without trenching on the fund to any great extent, or raising the price of gas above that of 2s. per 1000 cubic feet—at which it has now stood for eighteen months. Should, however, there be any material alteration in the price of coal, the Directors would be fully justified in temporarily raising the price of gas, so as to meet the increased cost of manufacture which this would entail.

An increase of only 1·5 per cent. in the consumption of gas is accounted for mainly by the great saving to the consumers by the use of the Welsbach mantle. The report states that about 80 per cent. of the consumers now use incandescent burners more or less, and that investigation shows that, on an average, the consumption of gas is reduced by its means by about 21 per cent. Thus the efforts of the Company to extend its consumption by obtaining additional customers is in course of being counteracted; but the Directors state that they have deliberately adopted the policy of recommending the use of the incandescent mantle, in the belief that thereby the position of the Company must be rendered secure. This policy cannot but commend itself to the shareholders as a wise and far-seeing one. A paragraph devoted to what is justly described as one of the great wants of our crowded cities and towns—viz., a cheap gaseous fuel—enables the Directors to refer to the recent Exhibition organized by the Royal Sanitary Institute and Smoke Abatement Society, at the conference in connection with which it will be recollected Sir George Livesey took a prominent part, and at which a general concurrence was expressed in the necessity for such fuel. If gas undertakings are to be the chief purveyors of this in the future, it will be in no small degree due to the lead taken by the South Metropolitan Company in destroying that which the report truly describes as the fetish of high illuminating power. The important measure of relief as regards gas testing, which the Metropolitan Companies have obtained through the passing of the London Gas Act, 1905, coupled with a reference to the burner devised by the Chief Engineer, Mr. Charles Carpenter (which is suitable for testing all qualities of gas, and which has been adopted by the Referees), enables the Directors to sound a pardonable note of triumph. This, they say, "is the reward of "thirty or forty years of persevering opposition to a popu- "lar fallacy hampering and doing an injustice to a great "industry, with no advantage, but a heavy cost, to the "consumers."

Among other matters, it is found that an increase of over 17,000 slot meters in the year has brought up the total of these meters in use to more than 190,000; but it is pointed out that this enormous extension has necessitated a heavy additional capital expenditure on plant in connection with this branch of the business. No one will, however, be disposed to consider as at all excessive a capital expenditure at the rate of £4 17s. 5d. per ton of coal carbonized. This is for the ten strenuous years from 1895 to 1905. There will be little cause for complaint if the next ten years' record be even less favourable. The report concludes with an expression of satisfaction at the continued fidelity of the staff and workmen, who labour loyally together for the mutual benefit of the Company and themselves. The statement of accounts shows a capital expenditure during the half year of nearly £40,000, almost the whole of which was for mains, services, meters, and stoves—thus giving point to the observation in the report in this connection. It has been increasingly apparent during recent years that the old relation between works and distribution capital expenditure no longer obtains; but it would be interesting to know what is the relation between them in respect of this Company, in view of the great predominance of slot over ordinary meters.

To Local Authorities Opposed to the Abrogation of the Sulphur Clauses.

THE towns affected by the Gas Companies' (Removal of Sulphur Restrictions) Bill and other Gas Bills which contain provisions for nullifying penalty testing in respect of the infinitesimal sulphur compounds other than sulphuretted hydrogen in gas, are not going to present a united front against the proposals to Parliament in the coming session; and few who are properly informed on this matter will, in the face of facts and happenings, be astonished at this. The greatest matter for wonder is that there can be found a single local authority willing to go to Westminster with any such invertebrate case as it is possible to present against these relief measures, or prepared to tacitly accuse Lord Rayleigh and the eminent members of the Departmental Committee of the Board of Trade who sat in 1904 of being a set of—let us say, persons of imperfect intellect. But there is satisfaction in finding that some of the local authorities are not showing the unwisdom of others. Wandsworth, Tunbridge Wells, and Chichester, have accepted the verdict of the Committee and of Parliament, and have decided not to trouble themselves further in the matter; and it is certain that they will not be found in the ranks of the authorities who—to give work at Westminster to those who do not care a jot for the matter of sulphur compounds, and whose knowledge of the question is perhaps not even commensurate with the relation that the number of grains of sulphur compounds bear to a cubic foot of gas—will be opposing on this matter during the coming session of Parliament. In addition to the towns named, the Law and Parliamentary Committee of the Gateshead Town Council have recommended the latter not to oppose; and there is no reason to think that the advice will not be adopted. Then again the Norwich City Council are so little concerned about these innocent grains of sulphur compounds in gas, that they have left it to the discretion of their Law and Parliamentary Committee as to whether or not they shall oppose; the latter having been counselled by Mr. Otto Hehner, one of the leading experts on this sulphur question, that the findings of the Departmental Committee are absolutely correct.

The information gathered leaves little doubt that such opposition as there will be has been conceived in the official mind; and we therefore appeal direct to the members of the Municipalities interested to look well into the matter, for if they do so they must see the shallowness of the case upon which they are asked to spend the ratepayers' money. Do they, we ask with all sincerity and respect, understand that out of the total of the hundreds of statutory gas undertakings in the country, there are only 45 (or less) concerns that are under these restrictions; and that, after their imposition in those cases, Parliament did not persist in applying them? Thus there are several hundreds of gas undertakings that have never from their start been called upon to work under the vexatious restrictions that the few have had to do, through what the most distinguished scientists of the day have adjudged to be the product of fanatical error. Do the local authorities also know that the beginning of the repeal of the restrictions as to sulphur compounds anteceded by many years the sittings of the Departmental Committee with Lord Rayleigh at the head; and that local authorities were among those who convinced Parliament, without the potent support of the scientific eminence which we have had in the Departmental Committee, that the removal of the sulphur compounds is a needless superimposition upon the duty (which gas undertakings, in their own interests, would not neglect) of purifying the gas of its sulphuretted hydrogen and other content that is really pernicious to good service? Are the local authorities also aware that, in addition to Lord Rayleigh and his distinguished associates on the Departmental Committee, Sir James Dewar, Dr. Thomas Stevenson, Dr. W. Odling, Professor Vivian Lewes, Dr. Samuel Rideal, Mr. Otto Hehner, and others whose names stand high in the world of Science, have given evidence before Parliamentary Committees in support of the Departmental Committee's opinion that, from the few gas undertakings to which the sulphur clauses have been applied, could be shifted the consequent intolerable nuisance and vexation without detriment to the consumers?

We may go further, and point to the fact that Parliament has removed, through a Bill promoted by the London County Council, and unopposed by the City Corporation and the Metropolitan Borough Councils, the restrictions from the London and the South Suburban Companies, and previously from the South Shields and other undertakings—in some of the latter cases before the Departmental Committee was even thought of. Again it has never yet been explained by the objectors to relief why Parliament only imposed these restrictions, in years past, upon about fifty concerns out of more than 700 (including local authorities). It has also to be explained why the gas consumers in the 650 odd towns where the restrictions are not in force do not suffer all the ills that certain officials, greatly daring, have conjured up for their authorities over the proposed relaxation in other towns; and why it is that to-day it will be difficult to find in London ordinary consumers of gas who had no previous

knowledge of what was happening who could now say that there has been, during the months that lime purification has not been practised, any difference in the gas supply from what obtained formerly. But, on the other hand, there are householders in the neighbourhood of gas-works who can assert that they have not experienced any further nuisance from the changing of lime purifiers, and gas workers who can attest to their immunity from the personal inconvenience suffered through the noxious work they were of old called upon to perform.

Confronted by so much which is assertive and conclusive that the Companies approaching Parliament in this matter are in the right, what is it the local authorities who are encouraging the idea of opposition propose to contest? They are proposing to contest something decision upon which has not been the work of a day. It has been before Parliament in several sessions, and from Parliament it was referred to a Committee of great scientific attainment who were requested to advise; and, after a most careful and patient investigation on their part, their advice was favourable to the over-restricted gas undertakings. All this was a costly matter for those who were in the van of the struggle for what they honestly believed was for the best, and which belief was so conspicuously confirmed in the event. What, therefore, the local authorities who are opposing the reasonable applications to Parliament this session are asking is, in effect, that all this work should be ignored, and the whole case be retried. It is meet that they should clearly understand their position. It will not suffice to merely tell Parliament that they object to the relief for which the gas companies supplying their respective towns are asking; they must go prepared to destroy the mountain of scientific and legislative evidence and opinion that stands before them, and establish that the men of Science to whom the question was referred are all wrong, and that their own local officials are in the right. If they are so satisfied that their case is such that they can do these things, then we say to them by all means push forward in what other people claim the right to believe, and on solid grounds, is an act of futility, which will only bring expense on the ratepayers and derision on those who are responsible for it.

Mr. Gadd on Gasholder Guidance.

THE article by this veteran in gasholder construction—the first portion of which appeared in last week's "JOURNAL"—which is concluded in our present issue, is of interest to all who have made a study of the subject, and especially to those who are practical followers of Mr. Gadd and his co-inventor, Mr. Mason, in the abolition of guide-framing. There is no doubt whatever that the system of spiral guiding which bears the joint names of these two inventors has many adherents, and as many believers in its advantages in point of reliability and economy. Nor is this to be wondered at. So far as can be recollected, there has not, of the many gasholders erected on this system, been a single instance of failure, while testimony is practically unanimous as to the steadiness which it imparts to the motion of a holder. In point of cost, too, it was by no means difficult at the time of its introduction—about sixteen years ago—to compete successfully with the massive guide-framing which was too much in vogue at that period. Much, however, has been learned since then; and, generally speaking, the construction of guide-framing has in latter times been reduced almost to a fine art. Not, however, that there is nothing left to be done in this direction; for the Old Kent Road 5 million cubic feet gasholder still points the way in which few indeed have followed with unhesitating steps. But heavy guide-framing is now a reproach to the designer; while the cost of this system has been much reduced by the introduction of what is known as the flying-lift—that is to say, an inner lift rising above the guide-framing and independent of it. It is therefore no disparagement whatever to the spiral system of guiding to say that the need for such a system is less now than formerly; it having served the useful purpose of stimulating improvement in the construction of the ordinary form of guide-framing. Moreover, the spiral motion which it gives to the holder is of itself in some respects a disadvantage, to overcome which is the object of the fresh invention of Mr. Gadd. This is described by him in the article now under consideration, and which it is a pleasure to publish. For example, ice has been occasionally known to form on the tank water inside the gasholder; and, when this is the case, the spiral motion of the latter is sometimes imparted to the ice with, possibly, damaging results to the inlet and outlet pipes. This is a contingency by no means pleasant to contemplate, and therefore to be guarded against, if by any means possible.

By Mr. Gadd's new invention, a vertical rise and fall is given to the holder; while at the same time the support afforded by the spiral guides is retained. This is accomplished by the addition of a sufficient number of vertical guides to prevent the turning tendency due to the friction of the spiral guides. But the guide-rollers of the latter, instead of being fixtures upon the tank wall or bottom curb of the holder, are attached to a wrought-iron ring of suitable dimensions which is made to move freely round the holder in a horizontal plane. As, therefore, the holder rises and falls vertically, the spiral guides, according to the inventor, give a horizontal circular motion to the ring, instead of a spiral motion to the holder itself. The spiral guide-rollers attached to the ring, being in gear with the spiral guides, allow the holder to rise and fall freely; the ring itself travelling horizontally in suitable bearings or supports. It is obvious that this arrangement is applicable not only to spiral guides attached to the tank sides and internally upon telescopic portions of the holder, but also to the reverse method, although it appears to be the opinion of the inventor that it is preferable to select the arrangement of spiral guides attached to the sides of the holder externally, with the guide-rollers arranged around the top of the tank, and on the outside of the dips in telescopic holders. That, however, is a question of detail, and not of principle.

The important question for engineers is, whether, to use a homely proverb, "the game is worth the candle." Ingenious, and at the same time simple, though the arrangement is (as will be seen by the sketches which accompany the article), the addition of the metal ring now proposed cannot but add somewhat of complexity to the structure of a holder, and what is perhaps of equal consequence, rather materially increase its cost. If this be so, it may well be asked what advantage is there in a spirally guided, vertically rising and falling gasholder, over one with an ordinary guide-framing constructed according to modern ideas? It is not by any means intended to suggest that spiral-guided gasholders, either with or without the addition now proposed, offer no advantages under certain or special circumstances. On the contrary, the system is generally recognized as a very useful one to employ under certain conditions. But it must also be said that it has not yet found general acceptance; and it remains to be seen if, on careful inquiry into relative merits, this latest invention of Mr. Gadd's has improved its chances in this respect.

The "Financial Times" and the Gaslight and Coke Company.

Our contemporary the "Financial Times" is usually so reliable in its information that we were surprised, as well as sorry, to see in yesterday's issue a paragraph relating to the affairs of the Gaslight and Coke Company, in which a singularly inaccurate view is taken of the policy of the Acting Governor (Mr. Corbet Woodall), as expressed in the course of his observations at last Friday's meeting of the Company. The portion of our contemporary's statement to which we refer is as follows: "Of late years, the internal policy of the Company has been all in the direction of economy; and not only has the staff been reduced in numbers, but the scale of remuneration has been severely cut down. In this curtailment of the Company's expenditure a prominent part has been played by Mr. Corbet Woodall, who has now, we learn, been appointed Acting Governor; and it may therefore be expected that the principle of cutting down, which has characterized the management of the Company since he joined the Board some eight years ago, will be continued." As regards the staff, Mr. Woodall has, of course, always wished that it should be as efficient as possible; but he has certainly never desired to cut down the individual remuneration of members of it.

Incandescent Lighting in Edinburgh.

There will be found elsewhere in to-day's issue an account by Mr. G. A. D. Mackay, the Inspector of Lighting at Edinburgh, of the introduction and extension of incandescent gas lighting in the city, as well as of the results that have been obtained thereby.

A full summary of the report was published in last Tuesday's number; but, as is explained, a portion of Mr. Mackay's argument was destroyed owing to a regrettable printer's error, which was not discovered until the "JOURNAL" was printed off. The document, it may be pointed out, has been called forth by the report on the public lighting of Edinburgh which was drawn up by Mr. J. F. Simmance, and reproduced in our columns last December; and Mr. Mackay devotes a considerable amount of attention to replying to Mr. Simmance's strictures. It seems that at the end of 1905 there were 4152 incandescent lights in the city, out of a total of 10,140 lamps; while it is anticipated that by the end of the current financial year, the incandescent system will have been so far extended that about 46 per cent. of the total number of lamps will have been converted. During the past twelve months, the number of mantles used per lamp was just over nine; and it is found in Edinburgh that, while the incandescent system is undoubtedly superior to the flat flame, the cost is a great deal more—the outlay being 41s. and 32s. respectively. With regard to the matters dealt with in Mr. Simmance's report, Mr. Mackay refers to the variations of pressure, maintenance, and the suggested replacement of 3-feet burners by 2-feet ones all over the city. He argues that the improved maintenance advocated by Mr. Simmance might be carried to such an extent as to render incandescent gas as costly as electricity; and he advances several reasons for the retention of the 3-feet burners in the more important positions in which they are now placed. In conclusion, Mr. Mackay asks why the candle values were determined by a standard No. 7 batswing and by an argand burner, consuming from 3 to $3\frac{1}{3}$ cubic feet per hour, instead of by the union jet burner prescribed by the Edinburgh Gas Act.

Minimizing Accidents to Workmen.

That "accidents will happen," even where the best regulations are in force for their prevention, is so generally recognized, that the phrase has passed into a proverb. Not unfrequently associated with it is another aphorism to the effect that "familiarity breeds contempt." It is perfectly well known that men who work day after day in dangerous surroundings, or upon machinery which, by some slight inadvertence on their part, may inflict serious injury upon them, are apt to grow heedless of the risks they are running. A man gets on to a line of rails and is knocked down by an engine; he uses an improper fastening for his support, and is thrown to the ground; or he is struck on the head by the flying lid of a centrifugal machine. Acknowledging the liability to accident of workmen in large industrial establishments, a question naturally arises as to the possibility of reducing it to a minimum. One obvious means of doing this is to encourage the exercise of more thought and care on the part of the men; and surely the best way of bringing this about is to increase their interest in the undertakings in which they are engaged. Make a man feel that he is something more than a piece of machinery earning profit for others, and that he has a personal stake in the concern in which he is engaged, and the chances are that he will be more on the alert to keep himself fit for the discharge of his duties than he otherwise would be. A mechanical operative will then have been converted into a thoughtful workman, and a mere wage-earner into a co-partner.

A Practicable Method.

These reflections arise on reading the interesting review of the accident fund of the South Metropolitan Gas Company which Sir George Livesey has contributed to the current issue of the Company's "Co-Partnership Journal," and reproduced in another column. He there shows, in a striking way, how, by "contracting out" of the Workmen's Compensation Act, the Company's workmen have "contracted in" to more liberal and better compensation for accidents than the Act provides. But this is not the main point, which is to prevent accidents occurring, and so, as Sir George puts it, "to save much suffering and loss to individuals"—this, in his large-heartedness, is his first consideration—and also to "save employers from loss." He shows how the Company's co-partnership system has helped to do this. In 1898, the first year of the fund, there were 4325 subscribers and 299 accidents, or nearly 7 per cent. Last year there were 6051 subscribers and only 243 accidents, or 4 per cent. The result is extremely satisfactory, and, as Sir George remarks, "it reflects great credit upon all concerned—engineers, foremen, and workmen." Every accident is inquired into by a Jury of twelve men, so that the injured are literally "tried by their peers;" and it is believed that this has done more than anything else to induce care in the avoidance of accidents, by "making men think." To the men's subscriptions to the fund, the Company add double; and last year the surplus was £319, which will be added to £157 previously in hand and carried forward. For some years there has been a feud between Capital and Labour. Will it be carried on with greater virulence as the result of the recent elections, or will the accession of strength to the Labour Party which has been their outcome lead to the display of a more conciliatory spirit on both sides? Time alone will prove. Meanwhile, owners of gas and other works may show that they take a real interest in their employees by doing all they can to improve their conditions of labour; and the methods adopted by the South Metropolitan Gas Company to attain this object, as set forth in the review we are noticing, may be commended to their attention.

Cyanogen Recovery.

In a paper which he read on Saturday before the Midland Junior Gas Engineering Association, Mr. J. H. Willoughby, of Leamington, dealt at considerable length, and in a highly creditable manner, with the question of cyanogen recovery in gas-works. He referred to the three sources of cyanogen in the distillation of coal—the gas, the ammoniacal liquor, and the spent purifying material; dealing fully with the first-named. The various systems of manufacture of cyanides on a commercial scale were also alluded to; and this brought Mr. Willoughby to the process of the British Cyanides Company which is at work at Leamington. Though he did not go deeply into figures, he stated that the operation of this plant had led them to consider that cyanogen recovery was quite capable of paying a good return upon the capital invested. But at the same time, he admitted that, as the percentage of the cyanogen compounds was low, it was only by dealing with large quantities of coal that the treatment could be rendered profitable; and also that the proportion depended very largely on the temperature of distillation. This latter point was emphasized by the speakers in the discussion. One member pointed out that, whereas the late Professor Foster quoted 1·56 per cent. of the total nitrogen contained in the coal as being converted into cyanogen, tests at several German gas-works (where much higher carbonizing heats are in vogue than here) showed that 29 per cent. of the nitrogen in the coal went to form cyanogen. Tests made at Birmingham, also, demonstrated that an increase of 100° in the temperature of carbonization caused the amount of cyanogen formed in the gas to be nearly doubled. Great curiosity was manifested as to the amount of cyanogen recovered per ton of coal; and this Mr. Willoughby was able to satisfy by the statement that in actual practice they were selling rather more than 4 lbs. per ton.

New Installations of the Dessau Vertical Retort.

The "Journal für Gasbeleuchtung," for the 3rd inst., reports that "the Dessau vertical retort appears to be rapidly gaining favour in Germany. The Imperial Continental Gas Association have decided to equip the new retort-house which is to be erected at the Oberspree Gas-Works, near Berlin, with vertical retort-settings, and these should be in operation before the end of the year. The Dessau works of the German Continental Gas Company—where the two trial settings have been in use for some time past—are to be extended this year, and will be provided with more vertical retorts, so that the whole output of the gas-works may in future be derived from the settings of verticals. The Potsdam Gas-Works are also to be provided with some vertical retorts this year, with the ultimate object of gradually passing over to their sole use on that works."

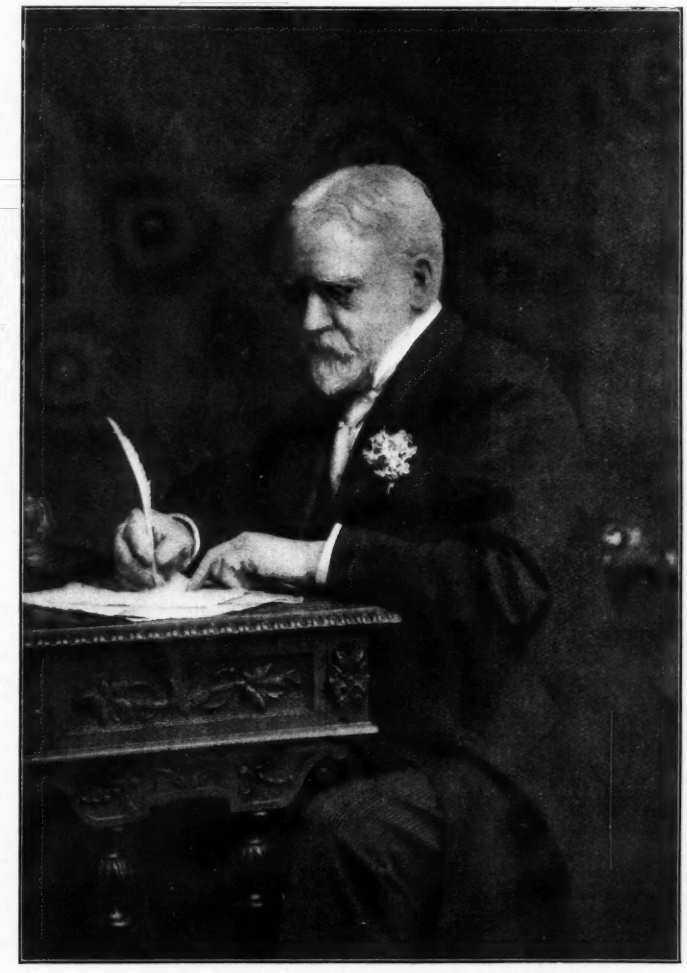
Mr. BENJAMIN BARK has resigned his position as Manager of the Godalming (Surrey) Gas-Works.

It is with much gratification we learn that the Right Honourable the Earl of Meath, His Majesty's Lieutenant for the County of the City of Dublin, with the approval of His Excellency the Lord Lieutenant of Ireland, has been pleased to appoint Alderman WILLIAM FRANCIS COTTON, J.P., a Deputy-Lieutenant for the county; his Commission bearing date the 20th ult. Most readers will doubtless remember that Mr. Alderman Cotton was for many years Secretary of the Alliance and Dublin Gas Company, and that he is now the Managing-Director, and presided at the half-yearly meeting in September last. We offer him our hearty congratulations on his selection for the important position he will in future have to fill.

OBITUARY.

SIR WILLIAM THOMAS MAKINS, BART.

It is with sincere regret that we record the death of Sir William Thomas Makins, Bart., the Governor of the Gaslight and Coke Company, which took place last Friday, at his residence, Rotherfield Court, Henley-on-Thames, in his 66th year. The sad event, coming as it did coincidently with the half-yearly general meeting of the Company, invests the proceedings on that occasion, which are reported in another column, with melancholy interest for the proprietors. It was known that the Governor had for some time been suffering from serious illness, which prevented him from presiding at the meeting last August. His unceasing interest in the affairs of the great undertaking of which he was the head was, however, manifest by the preparation of some notes on its progress in the period covered by the accounts then presented; and, as may be remembered, they were read by Mr. D. Milne Watson, the General Manager. In a letter accompanying these notes, Sir William expressed his regret at being unable, owing to his doctor's orders, to deliver them himself, inasmuch as that would be the first time since he joined the Board, in 1872, that he had been absent. This, as the Deputy-Governor (Mr. Howard Charles Ward) remarked, when reading the letter, spoke very well not only for the excellence of Sir William's health, but for "his devotion to the interests and business of the Company." The break in the long period of service which then occurred was destined, as not unfrequently happens in similar cases, never to be repaired. The signature of the Deputy-Governor at the end of the report presented last Friday afforded painful evidence that the owner of the name usually found in that place had been unable to take his accustomed share in the affairs of the Company. Nevertheless, that the hope was entertained by the proprietors that he might be spared to do so again, was shown by his unanimous re-election as a Director. Unhappily, this hope was dashed by an event which was almost tragic in character. It was ascertained that, while Sir William's re-election was in progress, news reached the office that he had passed away.



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Sir William T. Makins, Bart.

Sir William Makins was the eldest son of Mr. Charles Makins, of Woodhouse, near Leeds. He was educated at Harrow and Trinity College, Cambridge, where he took the degree of M.A. in 1861. In his 23rd year, he was called to the Bar at the Middle Temple, joined the Midland Circuit, and practised at the Parliamentary Bar. His first connection with the gas industry took place in 1866, when he became a Director of the Western Gas Company—a Company which, according to Mr. Rostron, had originally no parliamentary powers, but were allowed by the Vestries of St. James's and Kensington, as well as other western parishes, to lay down their pipes and supply gas. In 1872, the Company was amalgamated with the Gaslight and Coke Company, and Sir William joined the united Board. Eleven years later, the last of the Gas Companies on the North side of the river—the London—was taken over. At that time, the Hon. Richard Howe Browne, who had succeeded Mr. Simon Adams Beck as the Governor of the larger Company, relinquished the position on account of ill-health, and Sir William Makins was appointed. He presided for the first time at the meeting held in August, 1883, and, as already mentioned, he attended on every subsequent assembly of the proprietors down to that which took place in the corresponding month last year.

Engrossed as he necessarily was with the affairs of the Company—the largest gas undertaking in the world—they did not occupy the whole of his time. He was for nearly forty years a Director of the Great Eastern Railway Company, and became Deputy-Chairman in 1893; he was a Magistrate for Oxfordshire and Essex, a Lieutenant for the City of London, and Honorary Colonel of the 1st Essex Artillery Volunteer Brigade. In politics he was a Conservative, and sought to enter Parliament in 1868 to represent Kidderminster, but was unsuccessful. In 1874, however, he was returned as one of the two members for South Essex, and was re-elected in 1880. In 1885, he was chosen to represent the South-Eastern Division of the county; and in the General Election of the following year he won back the Walthamstow seat for his party. On the dissolution of Parliament in 1892, he did not seek re-election. He was created a baronet in 1902.

Though Sir William Makins, as already mentioned, had at one time many engagements, his duty to the Company which has just lost his services always held the foremost place with him. He was naturally desirous that it should occupy the front position among gas undertakings; and we believe he worked conscientiously on lines which, in his opinion, were calculated to ensure this. The present is not the time, nor is this the place, to discuss the Company's policy. It has been freely criticized in our columns in the past; it has been no less freely approved where changes have been effected to bring it more into touch with the modern requirements of the gas industry. This notice of Sir William Makins must not, however, be closed without reference to two matters which stand out conspicuously among his latest work. We refer to the great interest he manifested in the International Gas Exhibition at Earl's Court in the autumn of 1904, and to the steps he took with the view of securing united action by the three London Gas Companies in connection with the Gas Bill of the County Council's last session. Those of our readers who were present at the dinner on the occasion of the opening of the Exhibition will remember the interesting speech he made in proposing the toast of the "Municipal Institutions of the United Kingdom," which, in the truly patriotic spirit which was characteristic of him, he asked to be allowed to alter to the "Municipal Institutions of the Empire." In regard to the second matter, it is sufficient to say that the strong part taken by Sir William in promoting the union of the three Gas Companies affected by the Bill referred to was freely acknowledged by Sir George Livesey at the meeting of the Gas Companies' Protection Association last October, as it had been on several previous occasions. The result of this united action was, as Sir George remarked at the meeting alluded to, that the Companies succeeded on most points. He also referred in feeling terms to Sir William's illness, and expressed the hope that he would soon be thoroughly restored to health. The outspoken critic of the Horseferry Road administration was not a jot less sincere in his sympathy for its head as a suffering man.

Sir William married in 1861 Elizabeth, the second daughter of Mr. Lightly Simpson, the Chairman of the Great Eastern Railway Company, and had five sons and four daughters. Early last year, the family suffered severe bereavement by the loss of the then eldest surviving son, Mr. Basil T. Makins, who succumbed to heart failure at the early age of 36. The fourth son, Mr. Paul Augustine Makins, of Chiltern's End, Henley-on-Thames, succeeds to the baronetcy. Of the four daughters, two are married. To Lady Makins and the family we offer our sincere sympathy in

the irreparable loss they have sustained. The funeral will take place to-day, and a memorial service will be held at St. Matthew's, Great Peter Street, Westminster (not far from the Company's offices), at a quarter past twelve.

M. AUGUSTE A. LECOMTE, of Paris.

It is with much regret that we have to record the death of AUGUSTE ALEXANDRE LECOMTE, who was an Engineer and Chemist of high standing, and a prominent member of the Société Technique du Gaz en France. He died on the 28th ult., in his 38th year; and the funeral took place last Thursday at the Cimetière Montparnasse, Paris.

Our representative at several of the recent annual meetings of the Society sends us the following appreciation of M. Lecomte: It was with a feeling of real personal loss, and with the sincerest regret, that I received the intimation of the passing away of M. Lecomte, whom I had known since he became a member of the French Gas Society in 1899. I well remember the kindliness of his greeting in that year, which was renewed and increased at every succeeding year's congress. His usual exclamation when we met was "*Toujours fidèle;*" and such a motto might fittingly be inscribed on his tombstone, as it is indelibly on my own mind. He was only 37 years of age; but what a lot of work he must have crowded into them. To the Société Technique alone, in the seven years of his membership, he contributed no less than 17 papers, including the one he read before the International Gas Congress of 1900 on "The Use of Hydrocarbons as Illuminants in Competition with Gas."* This was a paper of nearly 60 pages, and some of his other contributions ran to over 50 pages; as did his first communication in 1899, which was a very complete and interesting one on high-pressure lighting, the incandescent mantle, and the causes of the variations in its lighting power. For this essay, M. Lecomte obtained a prize; as he also did for his two papers in 1901, his three in 1902, and his four contributions in 1903. These are all on record in the minutes of the proceedings of the Société Technique, and are also to be found translated in the pages of the "JOURNAL" at the various times. At last year's meeting at Havre, this most prolific writer and worker contributed three papers—one on calorimetry, another describing his own and M. Luchaire's new petroleum standard of light, and the third referred to inverted gas-burners. Such are some of the indications of M. Lecomte's energy and embraciveness, though nothing came amiss to this inquirer after scientific truth and investigator for exact detail. Anything that concerned chemical engineering, or engineering chemistry, or was allied to the progress of the gas industry, was at once full of interest and of opportunity to this born worker. This was fully recognized by the Committee of the Société Technique, who reported in 1904: "The Committee are greatly indebted to M. Lecomte for the energy that he shows every year in bringing into notice and popularity all kinds of apparatus for the utilization of gas." The facility of his pen was only rivalled by the fluency of his speech, and his ready utterances and extempore lectures will never be forgotten by those who heard them. Perhaps even more, and greater, than this, his courtesy of manner, his sympathy of style, and his kindness of heart will always be cherished by those who experienced them, as I myself invariably did. He died young, at the outset of a career of great promise and usefulness; and his death is a loss, not only to the gas industry of France, but to the gas industry throughout the world. He leaves behind him a great record of good work, and the pleasant memory of a kindly spirit. To Madame Lecomte and the bereaved, I, among many others in England, offer this small tribute of appreciation and sincere token of sympathy.

It is announced that Herr EDUARD BEER, the Manager of the Municipal Water-Works of Berlin, died suddenly on the 17th ult. He was for three years President of the German Association of Gas and Water Engineers, and one of its representatives at, and an Honorary President of, the International Gas Congress at Paris in 1900. He did away entirely with the use of river water for Berlin, and completed the works there by which the whole supply is drawn from wells. Deceased had only attained the age of 58.

We regret to record the recent death, in his 65th year, at the residence of his son, Mr. J. Compson Wright, at the West Ham Gas-Works, of Mr. WILLIAM BOURNE WRIGHT, who for a period of thirty years was Engineer of the Bromley station of the Gas-light and Coke Company. Deceased commenced his connection with the gas profession, which extended over 48 years, at the Brierley Hill Gas-Works under his father at the age of 15, and left there a year later to go to the Fulham station of the Imperial Gas Company under his uncle. On the amalgamation of the concern with the first-named Company, he passed into their service. In September, 1873, he was appointed Engineer of the new works which were then being laid out at Bromley-by-Bow, and held the position till September, 1903, when he relinquished it concurrently with other changes in the *personnel* of the Company. Unfortunately, Mr. Wright's retirement was followed by ill-health, which continued until his death, which resulted from cerebral hemorrhage.

* See "JOURNAL," Vol. LXXVI., p. 955.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 378.)

THE Stock Exchange did not have an entirely favourable time last week; being thoroughly dominated by the position in the Money Market. Business on the whole—taking the markets all round—was quiet; and the prevailing tendency (although not free from some occasional fluctuating currents) was dull. This was principally marked in the more speculative lines; for the gilt-edged class of security showed a firm attitude throughout. In the Money Market, there was no sign of relaxation in the stiffening; and the requirements at the end of the month helped to tighten the pressure. So far as can be seen just now, the situation does not look like changing in the near future. Business in the Gas Market was decidedly brisk, and the aggregate of transactions bulked up quite a considerable array. But they comprised to an inordinate extent dealings in the three big issues of the market; so that, if these were eliminated, the distributable residuum among the rest would be scanty indeed. But though most were quiet, and some altogether untouched, several of them advanced in quotation, and gave evidence of the general firmness which good gas undertakings hold in the estimation of the public. The notable exception was Gaslight and Coke; but even here there was no extravagant reaction because the undertaking has not realized its best hopes for the last half year. The ordinary stock was actively dealt in, at prices which ranged from 102⅜ on Monday to 100¾ (and 100⅝ special) on Friday. The secured issues were quiet and unchanged. The maximum was the more active, and marked from 89½ to 90¼; the preference was done at 111; and the debenture at 88 and 88¾. South Metropolitan had an outburst of activity, and then fell back into quietude. Prices were a little unsettled, and varied from 130½ to 132. The debenture was dealt in at from 87 to 88. Commercials exhibited their usual calm, with only a couple of bargains in the 4 per cent. at 117½ and 118½, and in the debenture at 86. The Suburban and Provincial group were even quieter than usual, but just as strong. Alliance old marked 21 and 22, Brentford old 267 (with a rise of 3), South Suburban debenture 136 (with a rise of 2), and British and Wandsworth debenture also rose. On the local Exchange, Liverpool "A" was put up, and ditto "B" was put down, thereby bringing them abreast in value. In the Continental Companies, Imperial was active and rose 3, with business marked at from 236¼ to 239. Union was not dealt in; but European rose ½, and touched 23. Among the undertakings of the remoter world, Bombay marked from 6 15/16 to 7 1/16, Buenos Ayres 12¾, Monte Video from 12 1/16 to 12¼, Primitiva ordinary from 7⅛ to 7¼, ditto preference from 5⅝ to 5½, ditto debenture from 99 to 99½, River Plate from 13 to 13⅛, and ditto debenture 97½.

The closing prices are shown in our Stock and Share List on page 378.

ELECTRIC LIGHTING MEMORANDA.

The Progress of Electricity Supply—Absurd Percentage Comparisons—Some Significant Facts—Public Lighting Prices—Power Companies and their Operations.

THE series of tables and diagrams published annually by "The Electrician" have made their appearance with the new year; and, as usual, they are teemful of interest and instructive figures, showing to any one who has the time and the inclination for statistical exercises the progress of the electricity industry. But taking the industry as a whole it is impossible, owing to a not inconsiderable number of electricity undertakings supplying energy for traction purposes as well as for lighting and ordinary power, to obtain total figures which can fairly be brought into contrast with the gas industry, so as to indicate correctly the relative rate of progress in those particular business regions in which they enter into direct competition. The first of the series of our contemporary's tables was published in 1889; and no one need be told that, during the sixteen years that have passed, the electricity supply industry has made enormous strides. It is an obvious fact; and the gas industry has not been blind to it. But at the same time, sixteen years ago the gas industry was a highly developed one, with a vast business, and since then lapses in increased business have been the exception rather than the rule. Sixteen years ago the number of electricity generating-stations recorded in operation, our contemporary informs us, was only 24, whereas, the tables this year contain details of close on twenty times as many.

About the only adverse criticism that has to be made in connection with the laborious and useful efforts of "The Electrician" is a ludicrous comparison in a note, by which credit is taken for electric lighting and power exhibiting an increase "of a much higher order of magnitude" than the gas industry. From figures recently published, it is said, the gas consumption in the United Kingdom was during the last year 178,699,989,000 cubic feet, as compared with 173,577,186,000 cubic feet in 1904; thus showing an increase of about 3 per cent. Then, again, the number of consumers during the same period rose from 4,955,706 to 5,260,747, or about 6 per cent. of an increase. On the other hand, the

connections to electric supply stations have the last three years (why should three years be taken?) increased from 503,570 kilowatts to 1,030,300 kilowatts, which gives an average increase of 142,243 kilowatts for each year, or over 28 per cent. In this way is the "higher order of magnitude" established! Our contemporary evidently does not appreciate the absurdity of percentage comparisons of increase based on such vastly different figures as 178,699,989,000, 4,955,706, and 503,570. Let the writer of the note in question think over the matter; and if he does not see the force of our contention, we shall be surprised.

While, too, the same writer takes the figures for two succeeding years only in the case of the gas industry, he introduces further fallacy in his comparison by adopting the kilowatt figure of three years ago for the electrical industry over which to spread the average increase of the three years. Had he taken last year's increase alone, and made his calculation on the total of the preceding year, perhaps the percentage of electrical progress would have been somewhat smaller. Had he taken the figures of gas consumption and consumers for three years ago, and worked out the percentage of last year's increase on them, peradventure he would have discovered larger percentages for the gas industry. The meanest intelligence must see the foolishness of such percentage comparisons, based on figures having no relation or similarity, as proof of increase "of a much higher order of magnitude." The figures already quoted show that the total connections to lighting stations in the United Kingdom at the present time amount to just over a million kilowatts, or the equivalent of 34 million 8-candle power lamps. As the electricians are fond of converting output to the equivalent of 8-candle power lamps, they may derive interest in finding out what is the equivalent in 8-candle power lamps of the 178,699,989,000 cubic feet of gas consumed in the United Kingdom last year, taking 18 candles as being obtainable per cubic foot of gas from a common incandescent burner. Modesty forbids our making the computation.

A few significant facts are brought into prominence by the comments of our contemporary on the tables. In the first place, the number of lighting stations which have added a traction load during the year is greater than that of the new stations opened for lighting supply only. Turning to the tables, it is found that there are now 122 undertakings supplying both lighting and traction, against 114 last year; but, comparing the prices charged for lighting and power by these undertakings, it is still seen that the addition of the traction load has not yielded any advantage to the ordinary consumers. The number of electricity undertakings without tramway loads is 262—a net increase of two on the year. Reverting to the editorial comments, it is mentioned that towns taking supply in bulk are on the increase. The tables show nineteen in this category already so supplied; and there are eleven other towns in which arrangements for taking a supply of electrical energy in bulk are either in progress or projected. Another point to which attention is drawn is the small number of new stations in progress; and eight are so classed in the tables. But this, it is thought, is largely accounted for by the increasing number of districts in which supply is taken in bulk from a large power house outside the area. There have, however, been many indications of further and greater development in this respect; and the Local Government Board, in the interest of the ratepayers, have done their part in encouraging it. Quite a number of new central stations are "projected"—72 we make the number—but some of these are not likely to get any farther than the paper upon which they have been delineated. The Provisional Orders, too, that have been undeveloped are numerous. Noticeable is the fact that gas-producer plants are gaining in favour in central stations; but suction-gas has only found entry into stations represented by a low single figure. These installations have chiefly been made in connection with small units; and no doubt the producer gas people are pleased enough to get in at the lower levels in the hope of rising to higher ones. Although our contemporary speaks of a steady reduction in the price charged for lighting supply having continued, the figures in the tables are not impressive in this regard. Decreased charge, however, is more marked in the case of supply for power and heating. But as to power, temptingly low prices which will pay the user are far from being conspicuous; and as to the low prices that are now being adopted for "cooking and heating," their only justification (if so it can be called) is that, even at 1d. per unit, the existing means of use are not economical to the consumers. For cooking and heating purposes, gas suppliers do not find it necessary to reduce their prices below those charged for lighting, in order to obtain and maintain a large business in these directions.

Public lighting has been of late the topic of lively controversy. Our contemporary admits the keenness of the competition of gas lighting, but holds that the increase in electric street lighting is well maintained. Omission, however, is made in this connection of any reference to the fact that what increase there has been of late has been, in large measure, in those districts where the local authorities are the owners of the electricity undertakings, and that, even among the more sober-minded of councillors on those bodies, there has been a growing alarm at the constant and considerable increase of the expenditure on public lighting with the extended application of electricity. There is one criticism we have to make relative to the prices given in the tables for public lighting. There is here insufficient information; but we are not alleging that the fault rests with our contemporary. Only in a few cases are the hours mentioned during which the public lamps are alight; and particulars are wanting in the majority of cases as to the lamps in use. Through the absence of these particulars, many of the prices named are next to worthless. For instance, we find arc lamps priced at anything between £10 and £28—of course, in different towns. But of what use is it to know that in one town £10 is charged, and in others much higher prices, if information is not imparted as to hours and type or power of lamp which will any way partly explain the wide differences? The same remarks apply to the inefficient incandescent electric lamps. Then the tables show that, in the effort to counteract the popularity of the incandescent gas-lamp, the complicated and unreliable Nernst lamp has been more freely brought into service; but we do not hear of it increasing in popularity with experience. The prices charged for this type of lamp show variations from £2 10s. to £5 per annum; but this difference is no doubt due to hours of use and powers. But ½ ampere Nernsts at £2 10s. are dear, and so (as ascent is made with increased price and power) are the other lamps of this type, in comparison with incandescent gas lighting. That is the experience wherever these lamps have been met with, and paying charges are made.

Turning to the great power companies established and in operation on what our contemporary calls a "permanent basis," they have increased their number by five during the year—making the total nine. But, in the main, the business incubation period is such a protracted one that there seems to be a fair prospect in some cases of the non-productive state being of a chronic nature. At all events, there are several companies who have secured area to exploit electricity power service and are hanging back from embarking on a speculation that has not yet proved a profitable one to the majority of the undertakers whose boldness has been greater than their discretion. As one swallow does not make a summer, so the success of a single electric power company is no guarantee that the others will eventually revel in the like prosperity. It has already been stated that there are nineteen towns in the country taking their supply in bulk; but only ten of these are, it is pointed out, customers of bulk companies. The prices charged by these power companies are not so striking as were the predictions of what they were likely to be; and they indicate the hollowness of the preposterous claims made when the promoters of these concerns were before the parliamentary committees. The Clyde Valley Company charge, it may be noted, 3d. to ¾d. per unit, according to quantity and load factor; the Fife Company 1½d. to ⅜d., according to quantity, with 10 per cent. reduction for continuous running (*i.e.*, above 16 hours out of 24); the Lancashire Company charge 0·45d. per unit, *plus* charges per kilowatt per year on a sliding-scale running between £6 and £3; the Midland Company charge for lighting 4d., with ½d. discount for payment within 21 days, on the maximum demand system 6d. to 3d., and for power 1½d. per unit, with discounts up to ¾d. per unit, or on the maximum demand system 3d. to 0·825d.; the Newcastle Company charge for lighting 3½d. per unit, less 5 per cent. discount, and for power 1½d. to ¾d., with discounts for large quantities. These will serve the purpose of example. Looking at these figures, there appears to be no reason why, if there is business really to be done, the existing electricity undertakings in London should not, within a reasonable period, be able to do as well as, if not better than, provincial power companies in the matter of price, and so save London the annoyance of having their streets torn up for the accommodation of a further gigantic concern. It may conveniently be remarked here, with regard to the power schemes that will be in Parliament during the coming session, that the opponents are getting themselves into fighting condition. The Lancashire Electric Power Bill is being viewed with consternation by the local authorities, and equally agitated are the Birmingham City Council over the Shropshire, Worcestershire, and Staffordshire Electric Power Bill; and they are proposing to oppose for the purpose of getting the city excluded from the operations of the measure.

The Price of Thorium and of Mantles.

Notwithstanding that they cannot yet be deriving any gain in the manufacture of mantles from the heavy fall in the price of thorium (to which reference was made last week), Messrs. Falk, Stadelmann, and Co., Limited, announce in another part of this issue that they are giving to buyers immediate benefit of the reduced cost of production by at once lowering the price of their Veritas and other well-known brands of mantles. It must be remembered that the reduction was so unexpected that makers found themselves (when the intelligence reached them) with fairly considerable stocks under their contracts at high prices.

The Annual Meeting of the Societe Technique.—It has been arranged, and notified to members, that this year's meeting of the French Gas Society will be held in Paris on the 19th of June and following days. The circular sent out also calls to mind the fact that the 1st of March is the latest date for the acceptance of international essays, and the 20th of May for members' papers. In addition to the ordinary prizes of 250 frs. to the authors of the three best papers read at the meeting, the whole series of a French technical publication, "Le Constructeur d'Usines à Gaz," offered by Mme. Durand, the *éditeur-gérant* of "Le Gaz," will be presented to the writer of the most notable communication.

THE VERTICAL RETORT TRIALS AT THE MARIENDORF (I.C.G.A.) WORKS.

The Results of Further Trials give Satisfaction to the Chief Engineer.

THROUGH misconception, criticism in these columns of the results obtained in the working of the Dessau vertical retort system has been interpreted as antagonism or prejudice on our part. Profession to the contrary has not been altogether accepted with the promptness that characterized the making of the charge—privately, if not publicly; and publicly just lately. It must therefore be reiterated that the nativity of any system or apparatus connected with the manufacture or the utilization of gas has no weight whatever with us; we are actuated solely by the one consideration of obtaining the best possible in every and any department of gas supply and use. It is, on these grounds, the greatest possible satisfaction to us to learn, and to be to-day the medium for the publication of the intelligence, that further trials of the Dessau system, with the 5-metre length of retort, at the Mariendorf works of the Imperial Continental Gas Association, has given the Chief Engineer (Herr E. Körting) such satisfaction as to allow him to report to his Board that he has now such little doubt that a considerable economy will be effected through these retorts, that, had he been in possession of his present results three or four months ago, he would not have hesitated to recommend the vertical system for the new Mariendorf retort-house. The eminent importance of this statement—coming from one who has worked so zealously to make the system comply with the necessities of a large gas-producing establishment such as Mariendorf, and who is answerable to his Board for any failure of recommendations involving so much as would have been represented in the installation of vertical settings at Mariendorf—is apparent.

It will be remembered that, at the last meeting of the Imperial Continental Gas Association, the Chairman (Mr. J. Horsley Palmer), with the utmost frankness and with the view to giving Herr Körting's professional colleagues in this country the results of the Mariendorf experiences thus far, read considerable extracts from the report on this subject of the Association's Chief Engineer at Berlin. The report, it will also be within recollection, showed that Herr Körting was not at the time so entirely satisfied with the results of the working of the trial setting—more than anything else through heating difficulties—that, combined with the (to a responsible engineer) essential proof as to durability, he could then recommend his Board to invest any large sums in making an installation. But, from a further report, dated the 6th ult., it appears that the temperature difficulties hitherto associated with the 5-metre vertical retorts at Mariendorf have been overcome. It can, however, hardly be straightway accepted that the question of durability has yet been settled; nor can it, without serious consideration, be at once conceded that the advantages in productive results are so compensative of loss in other directions that the balance of advantage lies altogether with the vertical retorts.

Nevertheless, the reversal of the experiences at Mariendorf is a matter of satisfaction to us, as it will be to all gas technicians who prefer progress to retrograde movement; and again our indebtedness is due to the Chairman and Board of Directors of the Imperial Continental Gas Association for permitting the "JOURNAL" to publish as early as possible—both in justice to the work at Dessau and Mariendorf, and for the information of the gas profession—an account of the improved results (prepared from extracts from Herr Körting's report, received through Mr. R. W. Wilson, the Secretary of the Association). And as an introduction to the results, it should be mentioned that at the time the report was despatched from Berlin (Jan. 6), the trial furnace at Mariendorf had been in action for more than two months. During this period, it was under constant and attentive control; the heats being measured, and the fuel gases analyzed. All the gas was purified in the ordinary way, and passed through a special meter. A small gasholder was filled gradually during each twenty-four hours, so as to contain an average sample of the gas produced. This was carefully examined with regard to specific gravity, calorific value, and illuminating power.

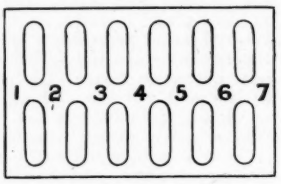
Heating.—Taking first the important question of the heating of the setting. Herr Körting informs us in his statement that the heats were very good and remarkably uniform, as may be seen from the following table:—

TABLE I.—*Temperature of Furnace in Degrees Centigrade.*

Flue No.	First Section (Bottom).	Second Section.	Third Section.	Fourth Section (Top).
1.	1336	1326	1033	
2.	1430	1336	1072	
3.	1435	1334	1040	
4.	1429	1332	1056	Could not be
5.	1447	1323	1035	
6.	1465	1360	1026	measured.
7.	1382	1357	1021	
	1418	1338	1040	

Regarding the seven flues, it is remarked in the report that these are the spaces between the six pairs of retorts. The sections are formed by three horizontal partition plates, dividing the furnace into four zones, one above the other.

Important though temperature is in the general question, there are other matters connected with the furnace and setting which will at once arise in the minds of engineers, and upon which information would be desired by anyone investigating the subject. Herr Körting at once appeases by giving, with admirable brevity, his observations upon those points which he conceives would be subjected to inquiry. He says that the furnace is a great deal simpler and more easy to handle than a Coze oven. The retorts have kept in perfect condition; and no deformation has been perceptible. This has also been remarked at Dessau, where the retorts have been in full and uninterrupted operation for, at the time of the report, 7½ months. The sliding out of the coke has



HORIZONTAL SECTION.

been perfect. The heats in the top of the furnace are very low; and therefore the top parts of the retorts will hold out probably for many years. The bottom part of the retorts will, there is no doubt, have to be renewed after a reasonable time; but this, trial satisfies, can readily be done through the bottom mouthpiece. Herr Körting therefore quite expects that the wear and tear of the furnace will be moderate, and possibly lower than that of the Coze furnaces. The construction being so new, he does not, of course, doubt that further improvements will be realized in time. He considers, however, that the present construction is quite reliable, and fit to be worked on a larger scale.

Coke.—Dealing next with the products, the coke, in Herr Körting's opinion, has always been of superior quality. A trial has been made to see how the consumers would like it; the plan adopted being the following: The stokers of "central heating" plants have, in a good many instances, a prejudice against gas coke, and will burn nothing but smelting coke. Through the agency of the large coke dealers doing business with the Association, several truckloads of the trial furnace coke have been sold; and, on inquiry, it is learned, that all the stokers have expressed their satisfaction with the quality. It may therefore be hoped that the vertical furnace coke will fetch somewhat higher prices than ordinary gas coke. This will be a very important item for all gas-works using Saar coal, the ordinary coke of which is very friable.

Tar.—The quantity of tar produced, over the period dealt with in the report, has been 4·21 per cent. by weight of the coal carbonized. The quality is reported as excellent. It has always been the same light brownish oil, which, owing to the absence of free carbon, has a 10 per cent. lower specific gravity. In Herr Körting's view, this tar is bound to fetch a somewhat higher price than ordinary tar. The following are comparative analyses:—

TABLE II.

	Tar from Verticals.		*Tar from Inclines.*	
Temperature.	Distillation. Per Cent.	Per Cent.	Distillation. Per Cent.	Per Cent.
0–100 ..	8·9 oil.	5·7 water.	1·0 oil.	0·85 water.
100–170 ..	1·2 ,,	—	1·6 ,,	1·85 ,,
170–230 ..	13·5 ,,	—	7·5 ,,	—
230–270 ..	7·3 ,,	—	10·27 ,,	—
Over 270 ..	29·3 ,,	—	18·80 ,,	—
Rest ..	34·1 ,,	—	58·13 ,,	—

It may be added that the ascension-pipes were always kept perfectly free; and such a thing as auguring and pipe-jumping may, Herr Körting says, be regarded as done away with. This will indeed be welcome news.

Ammonia.—Again in vertical retort working, the yield of ammonia is going to be a very important consideration; and upon it some figures are given by Herr Körting which will be investigated with no small amount of interest in many quarters.

TABLE III.

	Per Ton of Coal Carbonized.
The production of ammonia was in—	
November	2·78 kilos.
December	3·34 ,,
On the average	3·11 ,,
The production of ammonia at the Mariendorf works, on the average, in the year 1905, was	2·32 ,,
The verticals therefore produced more ammonia by	0·79 ,,
Representing an increase of 34 per cent.	

The Dessau results are reported to be still better; a production of 3·6 kilos of ammonia during the last seven months having been maintained. At any rate, the increase in the production

of ammonia is exceedingly valuable. In the first half of last year the profit on ammonia was 58 pf. per 100 cubic metres of gas; 34 per cent. more would be equal to 20 pf. per 100 cubic metres. or £2500 per annum for a Mariendorf retort-house with 25,000,000 cubic metres output. Thus the importance of this question of ammonia is seen. At the time Herr Körting forwarded his report, he was contemplating at once experimenting with the blowing of small quantities of steam into the retorts during the second half of the carbonization; and it is expected that this will have a beneficial influence on the production of ammonia. We shall be glad to hear the result.

Gas.—It is very difficult to make tests, says Herr Körting, if there are two unknown qualities: (1) The qualities of the furnace; and (2) the qualities of the coal. The quality of the gas coals used at Mariendorf varying to a fairly large extent, it is necessary, for coal trials in a single furnace, to collect samples from a great many trucks or barges, in order to get a fair average for the trial. This it was impossible to do at Mariendorf, as new coal plant was in course of construction; and the different coals had therefore to be carbonized as they arrived. This being the position, it was necessary to make continuous analyses of the coal in the laboratory; otherwise a deficiency in the coal might be regarded as pertaining to the furnace.

In the succeeding table are the results obtained with different coals:—

TABLE IV.

	Weight per Charge. Kilos.	Gas produced per 1000 Kilos. C.M.	Gas Produced per Retort. Charged. C.M.	Heating Power. Calories.	Duration of Charge. Hours.
Westphalian	659	316·6	418	5228	12·00
Silesian	566	320·9	422	5348	10 36
English	639	329·0	435	5428	11·35

Another point which has influence on the productive capacity of a retort, is the subject of Herr Körting's attention. He points out how high the specific weight of the Westphalian coal is, and how low that of the Silesian. As it is not possible to do more than fill a retort, this circumstance has considerable influence on the make per retort. For instance, though the Silesian coal is carbonized an hour quicker than English coal, the output per retort is higher in the latter case. The make per ton is quite normal in the cases of Westphalian, Silesian, and English coal.

At any rate, it will be possible, Herr Körting positively asserts, to produce more gas per retort and per day from Durham coal in a vertical setting than in a setting of the Mariendorf inclines. The output per ton will be about the same; but "the quality of the gas produced in the verticals is decidedly superior." With regard to this statement, a rather instructive comparison of gas produced at different Berlin works, and by different carbonizing methods, is the following:—

TABLE V.—*Heating and Illuminating Power of Gas from Different Works during November and December*, 1905.

	Municipal Gas.	Gitschinerstr. (Coze.)	Schöneburg. (Horizontals.)	Mariendorf. (Verticals.)
Heating power	4979	5188	5068	5370
Illuminating power	15·5	14·60	12·80	11·70

From these figures, it is seen that the heating power of the gas produced in the vertical retorts is better than that from the inclines; and this again is better than that from the horizontals. With regard to illuminating power, however, the gas from the vertical retorts is the lowest.

It has, however, to be stated that the Gitschiner Strasse works and the Municipal works use a large percentage of Silesian coal, which gives gas of high illuminating power, and comparatively low heating power. Anyhow, it is very curious that the gas from the verticals is 8 per cent. better in heating power, and 24 per cent. worse in illuminating power than the town gas. This, Herr Körting thinks, again shows what an unreliable standard illuminating power is for judging the quality of the gas.

The next table gives the average result of analyses of the gas from the vertical retorts:—

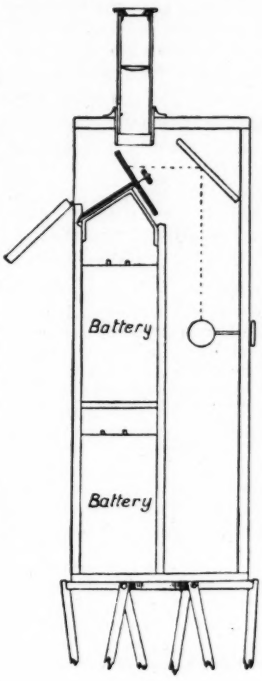
TABLE VI.—*Average of the Analyses during December*, 1905.

Heating power	5425 calories.
Illuminating power	12·30 sperm candles.
CO_2	1·6 per cent.
O	0·4 ,,
C_nH_m	3·8 ,,
CO	6·7 ,,
H_4	57·5 ,,
C_2H_4	26·8 ,,
N	3·2 ,,

By these experiences Herr Körting is of opinion it is proved that the Dessau vertical setting has passed the experimental stage, and has now to be classed among the tested and reliable gas-producing agents. All the products from it are either in quality or in quantity superior to those from other settings of which experience has been had in Berlin; and the labour is much reduced, even in comparison with the Coze settings. Those are his conclusions; and they must be taken as making another step in the progress of the vertical system.

HARRISON'S STREET PHOTOMETER.

At the Meeting of the Junior Institution of Engineers last Friday, Mr. Kenelm Edgcumbe read a paper on "Some Recent Electrical Measuring Instruments," and devoted a portion of it to a consideration of the various photometers now in use. In the course of his remarks on this subject, he dealt with the instruments used for street work, and attributed to Sir William Preece and Mr. A. P. Trotter the first photometer of this class. It was of the illumination type, and consisted of a horizontal card having a hole in the centre through which another screen, illuminated by a small electric lamp, could be observed. The latter screen was so arranged that it could be tilted at various angles, and the illumination on its surface varied by this means until it equalled that of the horizontal screen which received the illumination to be measured. A balance having been obtained in this way, a value was found for the illumination, depending on the position of the movable screen and the candle power of the small electric lamp forming the standard.



The chief drawback to the use of this photometer lies in the difficulty of obtaining a balance when testing, for example, arc lamps or incandescent gas-lamps, owing to the difference in colour. To overcome this, nearly all modern street photometers are constructed on the "Flicker" principle, and the various types are distinguished chiefly by differences in the standard of light employed and in practical details of construction, upon which latter, it may be said, the success or the failure of a street photometer really depends. The chief points to be aimed at are: (1) Portability; (2) rapidity of measurement; (3) ease of manipulation in a badly lit position; and (4) accuracy of measurement by an untrained observer under adverse conditions.

Before considering as to how far these several requirements are met by modern instruments, Mr. Edgcumbe thought a few remarks might not be out of place on the vexed question of whether candle power or illumination measurements should be made. It appears to be largely a question of exactly what is required. If it be to determine whether a certain street lit (say) by gas is as well illuminated as another street lit perhaps by electric arc lamps, then probably an illumination photometer will be the best; whereas if the efficiency of the lamps themselves is to be determined, clearly the actual candle power must be measured preferably at several angles. In the case of an illumination photometer, the choice has to be made of a certain fixed angle for the surface which is to receive the illumination to be measured. Both vertical and horizontal surfaces have their advocates, and each has certain advantages to recommend it. Quite recently, however, in a paper that was read before the Institution of Electrical Engineers at Manchester, Mr. Haydn T. Harrison advocated the adoption of an angle of 45° with the horizontal as a standard position. He claims, and in the opinion of the author rightly so, that very few of the objects which one wishes to examine are either vertical or horizontal, and that 45° therefore forms a very fair compromise. This angle has, moreover, a number of incidental advantages, from the photometric point of view, which need not now be entered into; but it may be added that it is extremely easy to calculate, from a measurement made on such a surface, either the candle power of the source of light or else the illumination on a horizontal or vertical plane as may be required.

The accompanying illustration shows the photometer designed by Mr. Harrison, so arranged that the illumination measured is that received by a screen at an angle of 45° with the horizontal; this angle being chosen for the reasons already given. An 8-volt glow-lamp forms the standard of light, and the illumination on the rotating screen of the photometer is varied by sliding the lamp backwards and forwards until a balance is obtained. The range of the instrument can be increased to any required extent by employing standard lamps of different candle power. The instrument is provided with a carrying handle at the top, and the three supporting legs hinge round so as to be out of the way. Thus it is extremely easy to carry about, and is quite self-contained—the batteries slipping into two compartments in the case.

GASHOLDER GUIDANCE.

PART II.

By W. GADD, F.R.M.S.

In the former portion of this article—after a brief *résumé* of the general history of gasholder guide-framing, and later means of guidance—the nature of the proposed new departure was set forth, as consisting of an invention whereby a simple vertical rise and fall may be given to the holder, while at the same time it is supported by spiral guides. In the present instance, it is the purpose of the writer to give such a description, with the requisite sufficiency of detail, as will enable the reader to fully understand how this end is to be accomplished, and whereby the problem, as above stated, may be effectually solved.

To enable this to be successfully done, with the least expenditure of wearying thought, the writer will request that the same process employed in the introductory portion of this article—viz., reducing the subject-matter to first principles—shall be freely adopted. If this is done, it becomes very evident that the spiral motion of the class of holder herein alluded to is the resultant of two tendencies to move, or force directions, which the spiral guides create. That is to say, there is an effort on the part of the spiral guides (which may be considered as simple diagonals arranged on a curved surface) to lift vertically and push horizontally, at the same instant of time. Now, as this is manifestly quite impossible, on account of the comparative rigidity of the structure, these two separate tendencies, or components, are perforce caused to result in motion on a line which forms the diagonal of the two—every point of the holder moving parallel with the spiral guides.

If this idea has time allowed it to get fairly gripped by the mind, it will become quite clear that, if some plan be devised whereby these two components can have free play to act independently of each other, the problem may be solved by allowing the vertical component to act upon the holder solely, while the horizontal one is in some way deflected therefrom. It is, of course, imperative that this horizontal deflection shall not in any way interfere with the primary object of the spiral guides, which is the support of the holder against lateral force or wind pressure, at every height of its up-and-down movement. This is, indeed, what is now actually accomplished, as the following more detailed description will tend to show.

In carrying out the present invention, the spiral guides may either be fixed to the sides of the tank, or on to the vertical surface of the gasholder bell, as may be preferred, in a manner similar to that which has heretofore been arranged with this class of holder. But, in addition thereto, vertical guides are employed—just so many, or so few, as may be found requisite to prevent the turning tendency due to the mere friction of the spiral guides. The present vertical stays, or a portion of them, may readily be utilized to form the vertical guides aforesaid, without adding any further material for the purpose. The guide rollers, or rubbing pieces, into which the spiral guides take, instead of being arranged as fixtures or resistance points upon the tank wall or bottom curb of the holder, as heretofore, are attached to a ring or band (of suitable formation) capable of freely moving horizontally around the circle, in such a manner that, as the holder rises and falls vertically, the spiral guides give a horizontal circular motion to the ring, instead of a spiral motion to the holder itself. Nevertheless, the ring, travelling horizontally in suitable bearings or supports, firmly and securely grips or holds the holder, through the intermediary of the spiral guide-rollers attached to the ring, all the time in gear with the spiral guides, and yet permits the holder to rise and fall vertically with the greatest of freedom. This obviates any inconvenience which, in some eventualities, may possibly ensue from the screw-like or spiral rise and fall which at present characterizes this class of gasholder. It will thus be seen that the ring may be considered either as a loose bottom curb, or otherwise, which takes up the horizontal component, in lieu of it being communicated to the holder itself.

Although the invention is equally applicable to spiral guides which are affixed to the tank sides, and internally upon telescopic portions, as it is to the reverse method, nevertheless—as it will only be necessary for present purposes to describe one of these forms—it is probably preferable to select the arrangement wherein the spiral guides are affixed to the sides of the holder externally, with the guide rollers arranged around the top of the tank, and on the outside of the dips in telescopic holders, as this is, for many excellent reasons, the variation which is thought to be the one more generally preferred.

The accompanying diagrams illustrate one form of the invention, of the variety indicated, as applied to the telescopic portion of a holder, and will serve for all purposes of description; as in the case of a first, or single lift, the tank wall may be understood as taking the place of the outer dip, as will be well understood by all versed in this particular practice. Fig. 1 is a plan of a portion of the circle of a gasholder; while fig. 2 is a section, on a larger scale, for greater clearness.

B represents the sheeting of the holder, and C the spiral guides. These take into the guide rollers D in the usual manner; but the latter are attached to the ring or curb E, set on edge. This ring rests upon, and is carried by, the rollers H, mounted upon the outer lift top curb by suitable brackets—similar to those already in use. It will thus be seen that, instead of the spiral guide rollers being mounted directly upon these fixed brackets, they are fixed to an intervening and horizontally movable ring, which travels forward as the holder rises. Supposing the mere friction of the spirals upon their rollers would be sufficient to cause the holder to turn somewhat if left free, the fixed rollers B, in contact with the vertical guides or upright stays K, at once prevent any movement of this kind becoming possible.

In this particular arrangement, it will be observed that the rollers H are of slightly less diameter than the channel-iron in which they work. In this way, while the holder is ever in its normal condition, the upper structure rests upon the top surface of the rollers, and therefore they are always free to turn in either direction the ring is travelling. But when wind pressure is brought to bear laterally, the bottom flange of the ring is raised into contact with the rollers on one side, so as to resist such pressure. The ring is rendered, in these circumstances, utterly incapable of movement in either direction, for the simple reason that one-half of the spirals are endeavouring to turn it one way, and the other half are equally trying to carry it in the opposite direction. Indeed, the same conditions prevail, under lateral strain, as do so in the ordinary type of spirally supported gasholders.

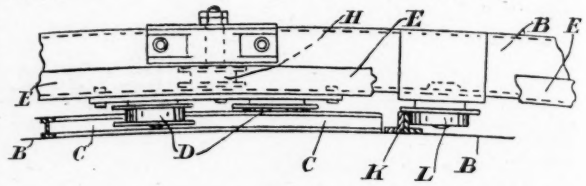


FIG. 1.

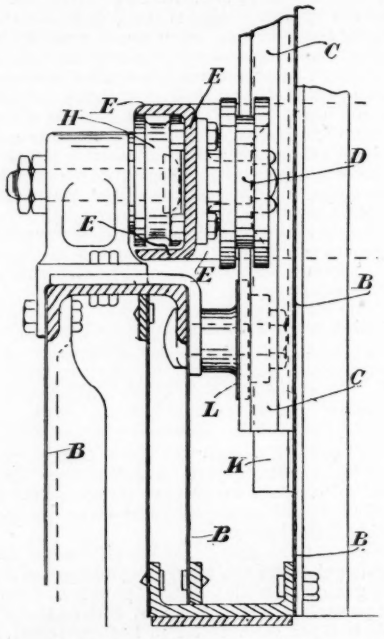


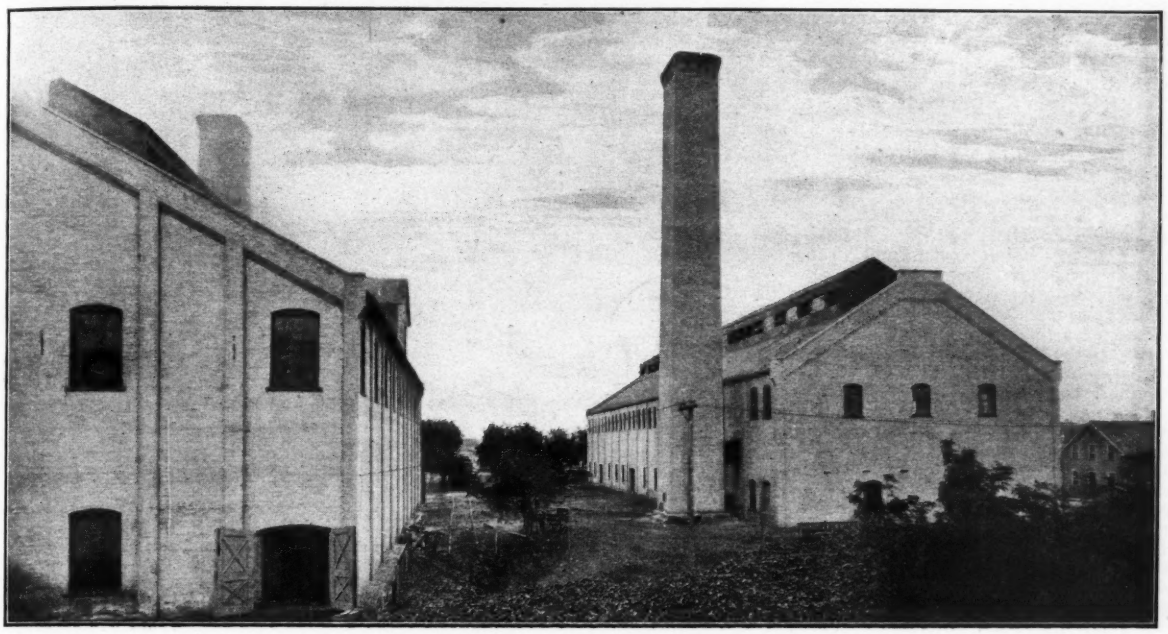
FIG. 2.

As the foregoing description and explanation are believed to be quite sufficient to enable those conversant with spiral holders as they now exist to clearly understand and appreciate this new departure, it only remains to add that the detail arrangement shown and described, is only one of a great number of possible variations of the invention. Indeed, every separate detail, as well as the general form of application, is capable of indefinite variety. The spiral guides may have any sectional form which is suitable for the purpose; as also may the guide rollers, as well as their mode of attachment, together with that of the spirals themselves, be varied as much as may be found desirable. Then the cross sectional form of the travelling ring is capable of much variety; and, furthermore, this need not by any means be a rigid ring—although comparative rigidity may be preferable—but may be made up of separate parts joined or pivoted together, so long as they are in any way caused to act in concert. Also the mode of mounting the ring upon, or in connection with, the necessary supports—whether as rollers or friction pieces—are all capable of being arranged as fancy, coupled with sound reason, may suggest to the designer, without departing in the least from the special and peculiar character of the invention, which, in short, consists in the giving to a gasholder, which is supported by spiral guides, a simple vertical motion during its rise and fall.

In conclusion, it is thought advisable to state that patents for this new departure have been applied for in the principal countries of both the Old and New Worlds.

GAS-WORKS CONSTRUCTION IN CANADA.

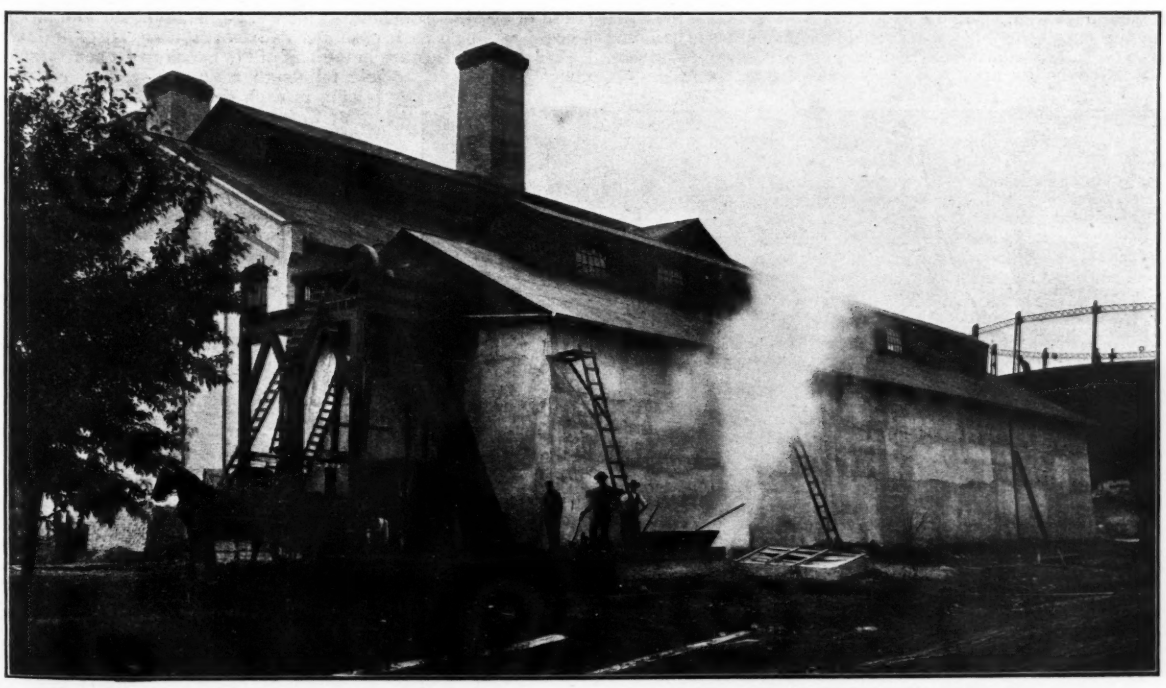
New Coal-Gas Plant at the Winnipeg Gas-Works.



A General View of the New Coal-Gas Works at Winnipeg.
(All the Plant Housed for Protection.)

Winnipeg—the Capital City of the Province of Manitoba, and the gateway to the millions of acres of the best wheat lands on the American Continent—in January of last year furnished our readers with some most interesting views portraying the rigour of the climatic conditions under which the construction of new gas-works plant was proceeding there. And now, through the kindness of Mr. J. T. Westcott, of the Economical Gas Apparatus Construction Company, we have the further pleasure of presenting our readers with a series of photographs, showing the completion of the first section of the new works. Some of the plant has a decidedly home-like appearance; and, indeed, as the previous references have informed readers, important parts of it had their origin in this country. But about the buildings and other portions of the plant there will be found, on examination of the photographs, features and details which will interest engineers accustomed only to the gas-works constructional methods and practices of their native land.

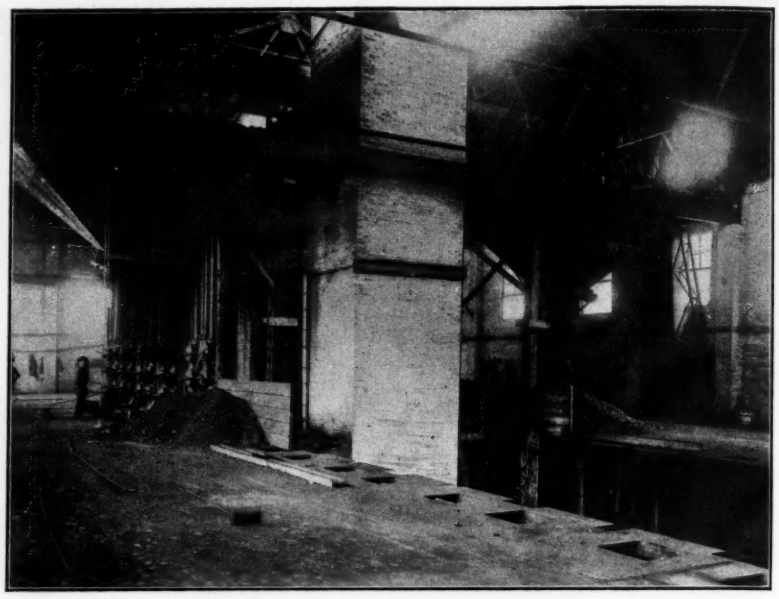
It is only since 1882, capital city that it is, that Winnipeg has boasted a gas plant; and in that year two small sets of Lowe carburetted water-gas plant were installed. Then in 1898, there was development; preference still being given to carburetted water gas. The extension of that year comprised two 5 feet sets (having a combined capacity of ½ million cubic feet per day) of the Merrifield-Westcott-Pearson type of plant, built by the Economical Gas Apparatus Construction Company, Limited. Those water-gas plants supplied all the requirements for a number of years. Steady, but by no means remarkable, was the growth of



The Retort-House, Coal-Stores, and Coal Receiving and Elevating Plant.

the city up to 1899, when the population was 50,000. But in the past six years the growth has been phenomenal; and there is a present population of about 100,000, with the prospect of it doubling in the next decade.

Naturally this, for Winnipeg, extraordinary increase in the population resulted in greatly extended demands for gas, and it necessitated the enlargement of the plant. To that end, the Winnipeg Electric Railway Company, who own and operate not only the gas-works, but the street railway system and electric lighting, determined to supplement their gas-producing works by constructing this time a coal-gas plant. This, in view of their possession of a water-gas plant, was indubitably a wise step on there part. Therefore, plans for a complete gas-works, from coal-store to holders and governors, were prepared. The contract for the whole plant to the yard connections—except buildings and foundations, which were constructed by a local firm of builders—was awarded to the Economical Gas Apparatus Construction Company. The expedition with which they fulfilled their engagement is seen from the fact that they received the commission in May, 1904, and it was successfully consummated in May, 1905, notwithstanding that much of the heavy plant had to be made in England, cross to Winnipeg (a matter of nearly 3000 miles), and be there erected.



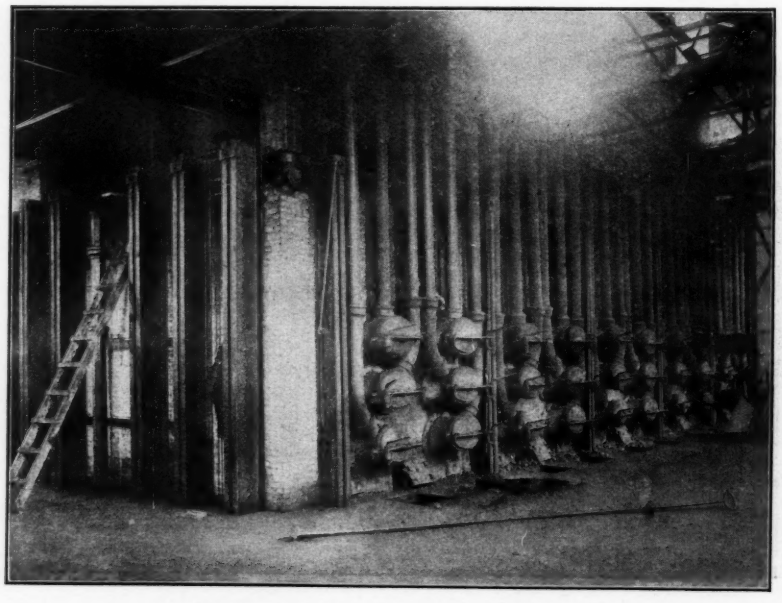
View in the Retort-House.

(Showing Coal-Hoppers, and Space for the Duplication of the Retort-Bench.)

In Manitoba, atmospherical temperatures take the extremes of what humanity care to endure in these respects; and the circumstances under which this work was carried out were enveloped in the greatest severity. Erection commenced in August, 1904; and although the weather was at times exceedingly unpropitious, the work continued without interruption to completion by the date formerly mentioned. To make matters as bad as they could possibly be, the building contractors were unable to erect the roofs of any of the buildings until late in the winter of 1904, owing to delay in the delivery of material; and all erection of plant had therefore to be done practically in the open in a climate where the temperature for the whole winter averages below zero. In several periods the thermometer registered for weeks at a time 20° to 25° below zero, or 52° to 57° of frost, while "dips" to 35° and 38° below zero were not infrequent. As one example of what had to be done, it may be mentioned that the retort-benches were built in the worst weather; and it was necessary to erect a temporary frame building around the stack, and keep fires going inside it the whole time. The benches have now been in operation some eight or nine months; and it is interesting to learn that they have not shown the least indication of damage resulting from the extreme weather conditions (which are unfavourable to excellence in brickwork) under which they were erected. In January of last year, in illustrating the conditions under which the station meter, purifiers, and gasholder were being erected, it was mentioned that, when the photographs were taken, the thermometer was some 25° below zero; and the difficulties of handling iron under such circumstances as these were, of course, very severe. "The men," it was added, "must work all the time with mittens on, as to touch cast iron with the bare hand would simply result in the skin being left behind." Fortunately the snowfall of the winter of 1904 was less than the average; and only upon a few occasions was it necessary to suspend operations for a few hours. That the work, under conditions so harsh, was carried on without serious interruption, is evidence that the Engineers of the Economical Company were resourceful and able.

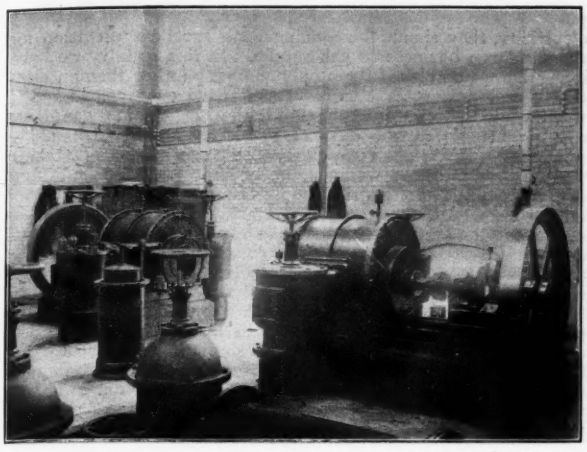
The details to hand do not enable us to prepare an extended account of the plant. But some general particulars may be given; and these the photographs will supplement. The works are designed for an output of a million cubic feet per day; and the views of the buildings all indicate that provision has been made for duplicating the plant, when necessity requires, and that event, with the rapid expansion of the city, is not likely to be remote.

In the view of the outside of the spacious retort-house, the method of delivering the coal by cart is seen. It is dumped into a coal-breaker hopper; and thence it is raised by an inclined gravity bucket elevator, which feeds on to scraper conveyors, and finally deposits into overhead hoppers on both sides of the retort-bench. At the present time, the retorts are charged by hand; but the plans for the future contemplate, when the corresponding retort-bench is built—and possibly before—the application of stoking-machines. This will be readily done with all the coal-handling plant in position. The retort-settings are of ordinary character. There are in the half of the bench so far constructed, five full-depth regenerative settings, containing in each six retorts, 16 in. by 28 in. by 21 ft. long. The retort-mountings and bench-fittings have nothing about them that is special. The hydraulic main is 24 in. by 24 in. It will be noticed that the bench is strongly buckstayed and braced.

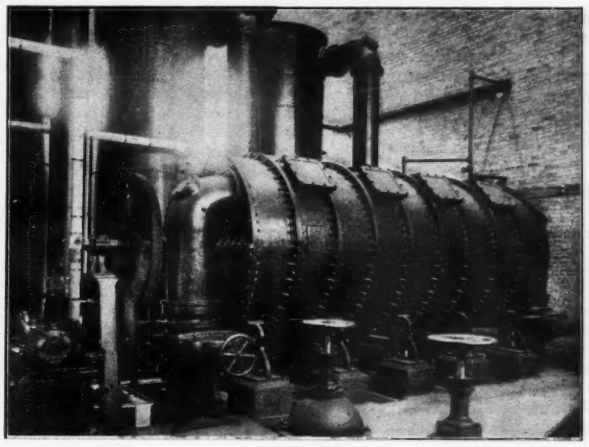


A Nearer View of the New Retort-Bench.

It will not escape the observant how little plant, compared with a gas-works at home, there is to be seen, other than the gasholders, outside the buildings. In fact, owing to the severity of the climate, all the plant is housed. Thus we have a second large building, in which are found under the one expansive roof the condenser and machinery room, the purifier-house, and the boiler-room. The inside dimensions of the condenser room are 33 ft. by 60 ft. Three multitubular condensers, each 6 feet in diameter by 24 ft. 4 in. high, are in place; and the situation is already marked out for their duplication. These condensers are of the Economical Company's own type, and are each fitted with 253 2½-inch tubes and ¼-inch baffle-plates to give the gas a zig-zag course. In the same building are found the exhausters, tar-extractor, and rotary washer-scrubber. The exhausters are of Messrs. George Waller and Son's make, and each has a capacity of 70,000 cubic feet per hour. The tar-extractor is capable of dealing with a million cubic feet of gas per day; while the rotary washer-scrubber, of Messrs. W. C. Holmes and Co.'s make is for 1½ millions.

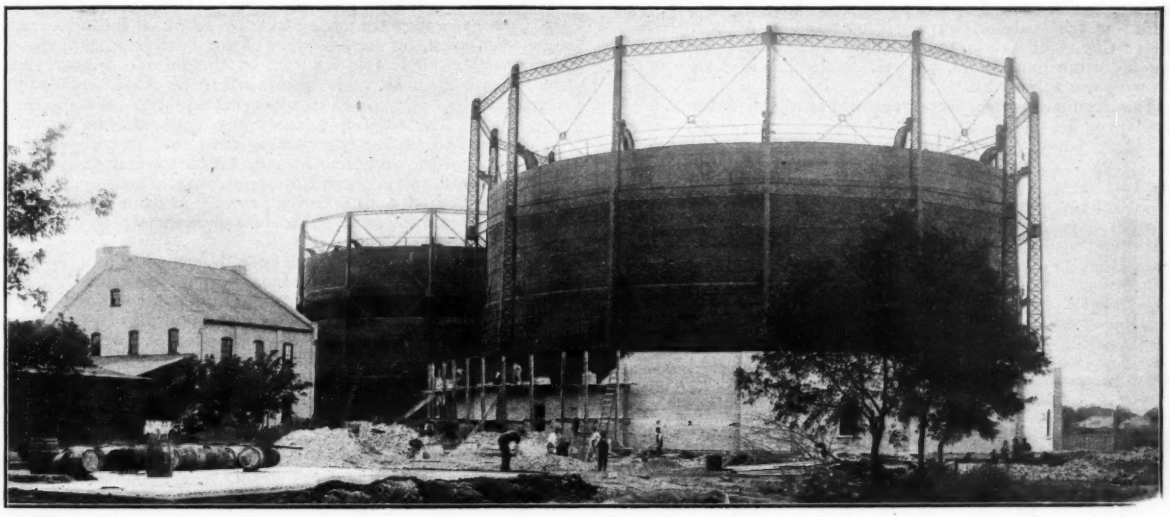


THE WALLER EXHAUSTERS.



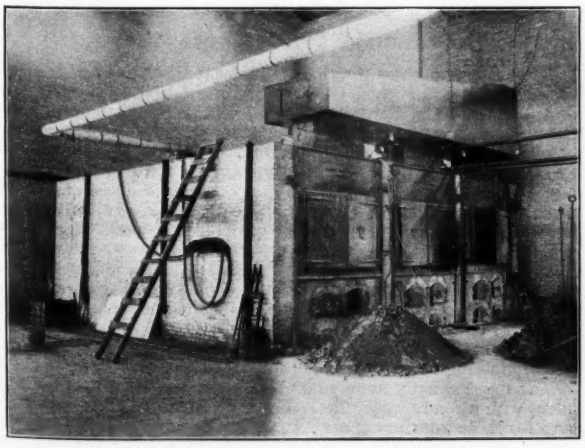
THE HOLMES' ROTARY WASHER-SCRUBBER.

The purifier-room is 60 ft. by 130 ft. inside dimensions; and, as will be seen from the photograph, the equipment could not be more up-to-date. We hazard the claim that this is the first installation of this type of purifier in Canada; and it was the Whessoe Foundry Company, Limited, to whom the work was entrusted by the Economical Company. The purifiers are elevated, and on Green's luteless system. There are four of them, 25 ft. by 25 ft. by 5 ft. deep; and there are four covers to each, 9 ft. square, which gives 2 feet of decking round the boxes and 3 feet between the covers. The centre-valve is of the Weck

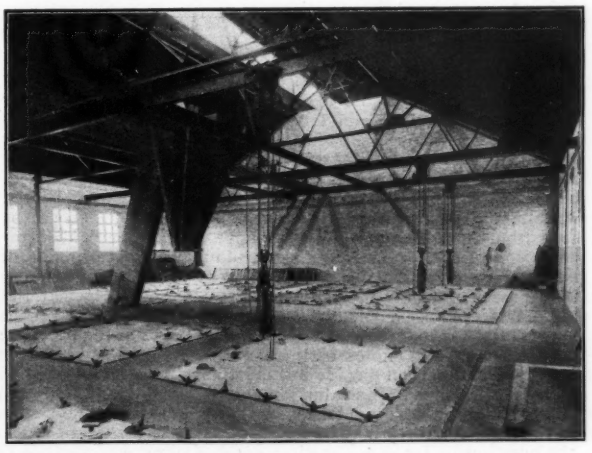


THE NEW TWO-LIFT GASHOLDER—THE HOUSE OF THE STEEL TANK IN COURSE OF CONSTRUCTION.

type. The house is replete with cover-hoists and travelling trolleys, oxide elevating plant, &c.—by all of which the character of strict modernity is fully established. It is almost the prevailing custom to use oxide in Canada; and, to the best of Mr. Westcott's belief, very little lime is used. The suppliers of gas in the great Dominion of Canada are not called upon to vex their souls over removing infinitesimal traces of sulphur compounds; and no one is a penny the worse. It is hoped that the few restricted companies in this country will be allowed similar freedom. The photograph of the boiler-house will be



THE SETTING OF THE THREE HORIZONTAL RETURN TUBULAR BOILERS.



GREEN'S PURIFIERS AND COVER AND OXIDE HANDLING PLANTS.

inspected with interest. The setting depicted encloses three horizontal return tubular boilers, 6 ft. by 18 ft. long.

The station meter and governor house is some 60 ft. by 40 ft.; and the plant it contains was put in by Messrs. James Milne and Son, Limited. The station meter has a capacity of 50,000 cubic feet per hour; and the two governors are of Milne's 18-inch compensating type.

The new gasholder, which in the photographs published in January last year was seen under construction by the Whessoe Foundry Company, is a two-lift one in steel tank. The lifts are 110 ft. and 112 ft. 3 in. by 26 ft. deep, and the tank is 115 ft. by 27 ft. deep—the latter being sunk into the ground about 12 feet. The tank, as seen in the photograph, has a housing of brick, to protect it from the weather; while steam-pipes run round the cups to prevent freezing in that position. At one time it was not uncommon in those cold regions to house the whole holder; but the latest practice is to only protect the tank.

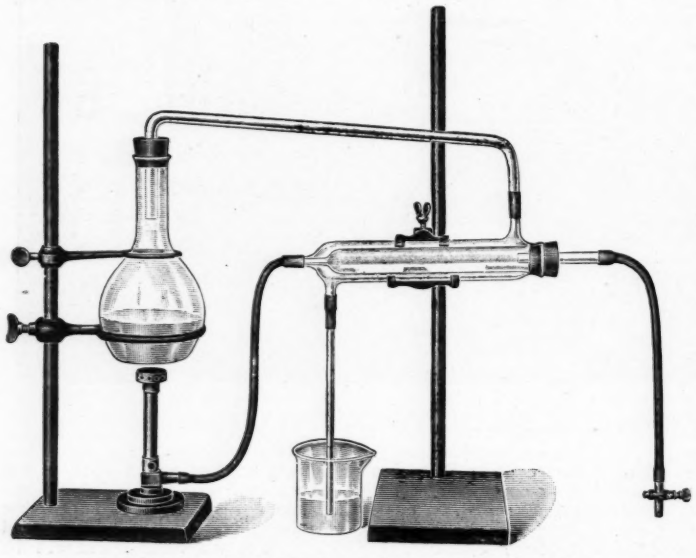
In all departments a complete pressure-gauge system is found; and the connections throughout the plant are 18-inch.

Perhaps the most remarkable thing about this account of the Winnipeg Gas-Works is the fact that it is a Company working the electric street railways and supplying electricity for lighting purposes who are the owners of the gas-works, and that, supplying electricity, they should be making such excellent provision for doing a large business in gas supply. In this country we have never known an electricity supply company (other than an electricity and power-gas company) who have ever considered it worth while to become suppliers of both electricity and gas; their opinion being that the days of the latter are unquestionably numbered. A few gas companies, on the other hand, are taking powers in connection with electricity supply. Here in Winnipeg, however, is an Electric Supply Company, who are not only the owners of the gas-works, but are believers in the future of gas to such an extent as to make a very considerable capital expenditure on it. They are to be congratulated on their politic action, which without doubt they will find productive of substantial reward. Under the described adverse conditions, which repressed rather than aided the work, the Economical Gas Apparatus Construction Company, Limited, are also to be heartily complimented on the rapidity with which the work was carried through, and on the general character of the completed plant, as clearly presented to us by the photographs. For our own part, thanks are due to them for the trouble they went to in having the plant specially photographed for the purpose of this article.

DRYING IN A CURRENT OF COAL GAS.

It not infrequently happens, in carrying out laboratory experiments, that small quantities of substances have to be dried, either with or without heat, out of contact with the oxygen of the atmosphere. Instances of this often occur in the laboratory of Messrs. Davis, of Manchester; and they have devised a "desiccator" which is described and illustrated in a recent issue of their "Chemical Trade Journal." We are indebted to them for the following particulars, as well as for the loan of the block showing the apparatus.

The drying chamber proper consists of a jacketed tube seen in the illustration lying horizontally in the retort stand on the right. Both the tube and its jacket are of glass. The jacket is supplied with steam proceeding from the flask on the left, entering on the right-hand side by the tubulature turned upwards, the condensed water leaving by the tubulature turned downwards—finding its way eventually by a glass tube into a beaker placed to receive it. Coal gas enters the drying-tube by means of the india-rubber tube and tap on the extreme right of the illustration, and, passing through the tube, finds its way to the bunsen burner shown underneath the flask. The substance to be dried is placed in a suitable boat, and slipped into the central tube of the apparatus. [The illustration shows two porcelain boats *in situ*.] The drying chamber is then closed with an india-rubber stopper, through which the gas tube passes; the gas is turned on; and after a few moments it is lighted at the burner, the flame from which, boiling the water, causes the jacket of the drying-tube to be filled with steam.



Apparatus for Drying in a Current of Coal Gas.

The appliance has been described as a dryer for use when the substance must not be exposed to the oxygen of the atmosphere; but its employment is not confined to this operation, as it is useful for all sorts and conditions of desiccation. There are, however, a few points to be noted in working with an apparatus of this kind. It must be ascertained whether the gas has any effect on the substance operated upon, as sulphuretted hydrogen, carbon dioxide, and carbon disulphide may act injuriously; so that the chemist should be on his guard, and interpose a purifying vessel between the gas supply and the drying-tube whenever it is found to be necessary. One other point remains to be noticed. Where much moisture has to be expelled, some of it may condense in the tube leading from the drying cylinder to the bunsen burner, and so possibly extinguish the flame. In ordinary cases this need not be anticipated; but in drying 30 grammes or so of any substance containing half its weight of water, the vapour may condense and the gas be extinguished, to avoid which, or any possibility of it, a small catch-bottle should be placed between the drying-tube and the bunsen burner, in which bottle this condensed water may deposit.

Analysis of Oxide of Iron and Lime.

Readers may remember that from time to time our pages have contained articles on the above subject by Mr. H. Leicester Greville, F.I.C., F.C.S., who for some years was the Chemist to the Commercial Gas Company. It was considered by the author that the matter would bear dealing with more fully than he was able to do within the limits of newspaper contributions; and he therefore decided upon amending and enlarging what he had written, and publishing it in a separate form. This, as will be seen from an announcement which appears elsewhere, has now been done. Mr. Greville first takes up the subject of oxide of iron and its valuation in the raw and the spent condition, and then passes on to the estimation of the "blue" in the material in the latter state. The subject of the analysis of raw and spent lime is afterwards discussed; and the final pages of the book are occupied with some notes on the determination of sulphuretted hydrogen and carbon dioxide in gas liquor. The author has had a large experience in the valuation and practical use of limes and oxides; and in the pamphlet under notice he submits the results in the hope that they may be found of value to all interested in the question under consideration, which, from the magnitude of its commercial aspects, must be deemed of very great importance.

The "Central" Counterbalance Pendant.

When noting in the "Journal" for Dec. 12 the "Central" Counterbalance pendant (Mr. George Helps's patent), it was stated that Messrs. Falk, Stadelmann, and Co., Limited, had in preparation a range of three-light clusters for use in conjunction with this new and serviceable fitting. The pendant, it was formerly explained, has a concentric movement, and the flexible metallic tubing employed in its construction is made of special strength suitable for the purpose. The firm have now introduced the development which they were proposing to make in connection with the pendant. The example seen has applied to it three inverted burners; and the combination is highly effective, and will please the most dilettante in these matters. Great success, we are informed, attended the introduction by the firm last season of a similar group of three-light inverted pendants with flexible metallic suspension; and we think they are quite justified in anticipating that the pendants now under consideration, combining the distinctly novel and useful feature of adjustability, will meet with a ready reception. For church and chapel lighting, and for large interiors generally, these pendants are particularly useful, as they enable the burners to be readily reached for adjustment, maintenance, &c.

ARRESTING THE ATTENTION OF THE PUBLIC IN BERLIN.

The New Methods of the Imperial Continental Gas Association.

THE cultivation of good taste among the public in gas-fittings, and of desire to possess the most economical and efficient appliances, the diffusion of knowledge as to the divers uses of gas, and the general development of business, now constitute a department of a gas undertaking which takes almost—some people are of opinion, quite—an equal rank with the operations within the gas-works. Competition has made it so, because well-directed competition is a menace to prosperity, and any loss of prosperity is a serious matter. Therefore many heads and much time have been, with varied result, engaged and spent on the increasingly important question of how best to court the attention and favour of the public.

The Berlin staff (under their chief officer, Herr E. Körting) of the Imperial Continental Gas Association have solved the problem to their own satisfaction and to the certain benefit of the Association. Head and front of their methods is the latest addition. Sanctioned by the Board, they have been fitting up a model suite of rooms in the Markgrafen Strasse; and the work is nearly completed. The suite comprise five rooms—viz., A small library, a drawing-room, a dining-room, a kitchen, and a bathroom. All the rooms are handsomely furnished—the furniture, painting, curtains, chandeliers, and fireplaces being of one design, harmonizing one with the other in line, colour, and character of material. The chandeliers, brackets, &c., are mostly fitted with inverted incandescent burners, the possibilities of which, in regard to variety and beauty of design are quite equal to electric light fittings, and greatly surpass them in respect of brilliancy of light. In this connection, Herr Körting confesses to having had many difficulties to overcome before being rewarded in finding inverted burners which were quite satisfactory, and in establishing proper rules for fitting them up. Combining inverted burners with practical and pretty chandeliers gives to the gas industry a poignant weapon in its competition with electricity; and, on all hands, it is agreed that what has been done by the Association in the Markgrafen Strasse will meet with the approval of the public.

In the code of principles upon which the business of the Association is worked in Berlin (and no doubt also at the other stations) is found this: "If people are given an opportunity of acquiring good and tasteful chandeliers, they will in many cases refrain from adopting electricity." Testifying to the truth of this, is the remarkable fact that, in a place like Wilmersdorf, out of 1473 tenements built in 1905, only 18 were without gas, though—note this!—42 per cent. were provided with the additional possibility of electric lighting. In consequence of the belief in the efficacy of excellent fittings, the Association make it a constant endeavour to improve the quality of their wares in the Markgrafen Strasse, and to give their consumers every facility in respect of the conditions of purchase. They may, if they wish, pay in twelve monthly instalments; and, indeed, they take advantage of this facility to a very large extent, as witness the following statement of sales during the last quarter of 1905.

Sales of Gas-Fittings for Lighting Purposes in the December Quarter of 1905.

	No. of Fittings.	Value. Marks.
For cash	485 ..	16,238·00
In twelve monthly instalments	**598 ..**	**28,588·80**
With prepayment meters . . .	5762 ..	15,028 00
Total . . .	6845 ..	59,854·80

Turning from gas-fittings to gas-cooking and other arrangements. In the kitchen of the Markgrafen Strasse suite, there have been fitted up, ready for use, two different sorts of kitchen ranges, a grilling apparatus, a plate-heater, a water-heater, &c. Business in cooking utensils is, of course, not nearly as extensive now as it used to be when gas was beginning to be utilized as a household heating agent. Nowadays Berlin is almost fully supplied; and there are no new acquisitions beyond what is required to satisfy wear and tear and for new houses. Moreover, there is such an abundance of various apparatus at low prices to be had all over the city, that the share of the Association in the sales is naturally a limited one. They try, however, to always exhibit the best models for particular purposes, and to assist the smaller consumer, who has not ready cash, to acquire cooking apparatus by letting it out on hire and by allowing his payments to be by instalments, as well as by means of prepayment meters, to which a cooking-stove is always attached.

In the bath-room, a pretty bath is fixed, with a modern geyser. Frequent bathing is no longer the privilege of England; it has become quite general in Germany. Some 76 per cent. of the new Wilmersdorf tenements have bathing facilities. Gas is found to be admirably suited for heating the water; its action being much quicker than that of coal or coke. Besides this, it causes no labour or dirt, and the geyser takes up very little room. The consumption of gas for this purpose may prove very considerable—at all events, the Association are trying to push gas geysers as much as possible. The competition to be met is the warm-water supply from what is termed the "central heating," and, of course, the usual coal or coke warming apparatus.

A great deal of trouble was taken over the fitting up of the model suite of rooms. The designs were the work of well-known artists in Berlin—Herr and Frau Wille. Through their help, too, terms were made with a Brandenburg firm, who supplied the furniture of the dining-room *gratis*. The same thing was done by Schaeffer und Häuschner as regards the lighting appliances; and by Villeroy and Boch, for the tiles. The furniture of the drawing-room and the library was supplied at cost price by a Berlin firm. These are useful hints.

From the information to hand, there is no doubt the exhibition has made a good impression, and it will certainly bring credit upon the Association as well as business, in addition to assisting to keep the consumers informed of the latest improvements in a manner which will strongly appeal to them. A fitting or a stove in a furnished room appears different altogether from the same thing buried among numerous others in a show-room. The rooms are being well advertised. Representatives of the Press have been invited to visit them, as well as gas engineers of Greater Berlin and their families, architects, &c., and the leading firms in the gas installation line of business. This has been done by invitation cards; and advertisement cards have also been issued. Invitations are to be printed on every gas bill; and invitation cards will be sent to every consumer through the collectors and to numerous non-consumers by post. In these ways will the model rooms of the Imperial Continental Gas Association in the Markgrafen Strasse be made known.

Reference has been made in this article to the new Wilmersdorf tenements. In a letter to the Secretary of the Association (Mr. R. W. Wilson), Herr Körting makes the interesting statement that "40·5 per cent. of the new Wilmersdorf lodgings are provided with central heating. This is of great interest to the Association, because the fuel for the central-heating boilers is nearly exclusively gas coke. The large coke dealers confirm that the demand for coke from this source is rising steadily, and foresee even a scarcity in coke as soon as the large water-gas installation projected by the Municipality of Berlin comes into action." Naturally, Herr Körting hopes that this will prove to be true; "for a period of high coke prices would be a great thing for the gas industry, after so many years of depression."

We heartily congratulate the Association upon their enterprise in making such an interesting addition to their information-propagation methods.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report.

The following is the report of the Directors of this Company for the six months ending Dec. 31, which, with the accounts for this period (some particulars from which are given on p. 363) will be presented to the proprietors at the half-yearly meeting to be held to-morrow week.

The revenue account for the half year shows a profit of £187,915 11s. 5d.; being £16,616 14s. 11d. short of the sum required to pay a dividend of 5½ per cent. In the corresponding half year, the price of gas being also 2s. per 1000 feet, the profit was only £172,436 15s. 1d., while products then realized £24,864 more than in the half year to December last. Consequently, in the face of such a loss on products, and with an increase of consumption of only 1·5 per cent., to have gained £15,478 is good evidence of satisfactory working.

The main cause of the small increase is the great saving to the consumers of gas by the constantly increasing use of the Welsbach mantle. Recent inquiries in many parts of the Company's district show that about 80 per cent. of the consumers are using the mantle more or less. By investigation of the accounts of a number of those consumers who have partially adopted the mantle, it has been found that the consumption of gas is reduced on an average about 21 per cent. The Directors have deliberately adopted the policy of advising all their consumers to use the incandescent mantle, because thereby the best and cheapest of all artificial lights can be obtained; and thus the position of the Company is rendered secure. They believe this policy will be to the advantage of the Company, notwithstanding a temporary check to the large increases of consumption that have until lately prevailed.

One of the great wants of our crowded cities and towns is a cheap gaseous fuel; and the Welsbach invention makes this possible, because a highly luminous gas is no longer necessary. In December last, the Royal Sanitary Institute and the Smoke Abatement Society organized an Exhibition of Appliances for the Prevention of Smoke, together with a three-days conference

on the subject. There were many references to gas; and the necessity for a cheap gaseous fuel that could be used for all purposes was strongly urged by many speakers unconnected with the gas companies. The chief obstacle is the ignorance and prejudice of the local authorities generally, who fail to appreciate the new conditions of the use of gas. The Companies are hampered with the fetish of a past age, that a high illuminating power from a luminous flame is still necessary. By persistent action, in which this Company has taken a prominent part, progress in the right direction is slowly, but surely, being made.

The testing of gas, which to the responsible officers and foremen of the London Gas Companies has for a generation been an intolerable burden, is at last put upon a footing whereby honest men can comply with the requirements without difficulty or anxiety; and the public are not a penny the worse—in fact, rather the other way, because the removal of needless and vexatious restrictions tends to a lowering of price. The Company's Chief Engineer (Mr. Carpenter) has devised a suitable burner for testing all qualities of gas, which has been adopted by the Referees for London. A reasonable test for sulphuretted hydrogen has been introduced; the test for ammonia is abolished; and the restriction as to the sulphur compounds is removed. This is the reward of thirty or forty years of persevering opposition to a popular fallacy, which, hampering and doing an injustice to a great industry, was no advantage, but a heavy cost, to the consumers.

The dividend payable under the sliding-scale when gas is sold at 2s. per 1000 feet is at the rate of £5 14s. 8d. per cent. per annum; and had it been earned, the Directors would have recommended the payment of a dividend at the rate of 5⅞, or £5 13s. 4d. per cent. Under the present circumstances, they recommend the same dividend as the last—viz., at the rate of 5½ per cent. per annum—which, after deducting the deficiency of profit from the balance brought forward, will leave £5683 to carry forward. The reserve fund of £174,305 remains intact, and amply guarantees the maintenance of at least the present dividend at the existing low price of gas; or, if necessary, the price could be raised without reducing the dividend, because the full dividend under the sliding-scale is not being paid.

There are 190,640 slot meters now in use—an increase of over 17,000 in the year—partly transfers from ordinary consumers. But the enormous extension of this branch of business in the last ten years has necessitated a very large capital expenditure on mains, services, meters, stoves, and fittings.

In the ten years from 1885 to 1895, the capital increased £964,078, and the coal used by 305,264 tons, or at the rate of £3 3s. 2d. per ton; whereas in the next ten years, 1895 to 1905, £1,602,769—two-thirds of it due to the slot meters—was added to the capital, and 370,541 tons to the coal used, or £4 6s. 6d. per ton on the increase. Such an increase of capital per ton of coal for new business would have been a serious matter, but that in the ten years the gas sold per ton has risen from 9340 to 10,223 cubic feet. The total capital per 1000 feet sold was 9s. in 1895, and 8s. 5d. in 1905, which favourable result is mainly due to improved working, and partly to the nominal reduction of illuminating power.

The Directors are happy in their staff of officers and workmen of all ranks. That all should work loyally together for the mutual benefit of the Company and themselves is highly important, for on the items of salaries and wages much may be wasted or saved. This will be apparent from the statement that about £75,000 a year is paid in salaries, and about £480,000 in weekly wages.

Two Directors (Captain Thomas Bridges Heathorn and Mr. Edward Henry Cardwell) and one Auditor (Mr. Charles Mortimer) go out of office by rotation. They are all eligible for re-election, and offer themselves accordingly.

KEROSENE LAMP AS A STANDARD OF LIGHT.

In the course of the editorial remarks in the "Journal" for the 9th ult., on the standard oil-lamp for gas-works photometry described in an article by Dr. A. H. Elliott, the Engineer-Chemist to the Consolidated Gas Company of New York, in another part of that issue, it was suggested that the idea of using kerosene as a light-standard had possibly occurred to others, though we could not remember that there had been any publication of information in regard to investigations into the matter. We are reminded by Mr. Frederic Egner, of Norfolk (Va.), that he contributed a short article on the subject to the "American Gaslight Journal" in 1884, which we find was reproduced in our columns at the time. Mr. Egner pointed out that the use of the candle in the photometer-room was not satisfactory, as evidenced by the fact that gas engineers on his side of the Atlantic—men of world-wide reputation—had for years been engaged in conducting experiments with a view to finding a substitute which would prove of greater accuracy; and one of these gentlemen proposed to employ, instead of the objectionable candle, a high-grade naphtha, which could be readily vaporized. "But, why not use kerosene?" asked Mr. Egner. He said that this oil, of good quality and even grade, could be easily obtained; was not affected by ordinary variations of temperature; could be readily controlled as to height of flame and quantity consumed; was the illuminating agent generally employed by the people; and, furthermore, was the oil which was also the strongest rival of gaslight, by reason of its adaptability and apparent cheapness. Mr. Egner did not think the fact that kerosene is one of the most powerful rivals of gas lighting, could possibly be advanced as a reason why its use should be avoided as a standard of comparison. On the contrary, in his opinion, it was one of the chief reasons why it should be so used. He said he had himself made a series of experiments bearing directly on the subject; and he gave the following results:—

The gas, tested on a bunsen photometer, supplied with all the requisite appliances, and a "London" argand burner (No. 1, 24 holes), averaged 21·63 standard candle power. A kerosene lamp was then substituted for the candles; and the gas was shown to give a light equal to what, for convenience, might be called 1·95-lamp power. The burner used on the lamp was of the kind known as No. 2, and said to be one of the best specimens of the sort commonly used. The oil employed was of the brand called "Elein;" fire test 150°; and half-a-pint of it weighed 3000 troy grains. The flame was 1 inch wide at the base; 1½ inches at the top; and was regulated to a height of 1⅛ inches. When adjusted to the height mentioned, it consumed 500 grains of oil in one hour, and 8⅓ grains in 10 minutes. The consumption of oil was remarkably uniform, though tried on different days, and for hours together. So also on the photometer; while with the candle the results at times varied 3 candles in a period of 10 minutes. When using the lamp, the position of the photometer disc once fixed, it was not found necessary to alter it. No matter how frequently moved, the disc would, on readjusting, be found in the same place as before.

Mr. Egner added that it could be shown, from the experiments, that the asserted greater relative cost of gas over oil illumination was decidedly more fanciful than real; and he urged that the "obsolete, unreliable candle" should be thrown over, and a good kerosene lamp employed instead; allowing the gas to be known by its "lamp" and not by its "candle" power.

GAS PROVISIONAL ORDERS FOR 1906.

Through a misunderstanding and a subsequent oversight, omission was made in our notices last week of applications for Orders to the Local Government Board of the one emanating from the Arlecdon and Frizington District Council. In the schedule of the Order is described a piece of land which the Council purpose acquiring (of course, by agreement). Upon it, they ask to be authorized to construct gas-works, from which to supply within the boundaries of the urban district. All the ordinary requisite powers appertaining to gas supply are desired; and it is proposed that the gas to be distributed shall be of 14-candle power, tested by Sugg's "London" argand No. 1, or any other burner approved by the Board of Trade. The price of gas is not to exceed 6s. per 1000 cubic feet; and discounts and rebates for prompt payment or large consumption may be upon such scale, and subject to such conditions and regulations, as may be prescribed by the Council. The Council request to be allowed to borrow all necessary money with the sanction of the Board. The period of repayment is to be determined by the Board, but is not to exceed fifty years from the date of borrowing. Most of the remaining clauses refer to the regulation of the finances. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

WATER BILLS FOR 1906.

(*Concluded from p. 283.*)

The Metropolitan Water Board will be in Parliament next session for the first time, with a Bill to authorize the construction of additional water, sewerage, and other works in the valleys of the Lea and Stort. They comprise two intercepting sewers, three conduits or pipe-lines, and five aqueducts; and power is sought to acquire the necessary land for them, as well as for a pumping-station and sewage-disposal works. The Board seek authority to take additional water from the Lea, Stort, and Lynch, to stop up a portion of the first-named river, and discharge sewage effluent into it. A period of seven years is specified for the completion of the works referred to in the Bill; and the Board ask for an extension of the time for constructing the storage reservoirs mentioned in the East London Water-Works Act, 1900, till seven years after the passing of the Act now being applied for. The Board ask for sanction to the raising of £750,000 for the execution of the works indicated, and, with the approval of the Local Government Board, such further sum or sums as may be required—all to be a charge upon the water fund and the revenues of the Board. A period of sixty years from the date or dates of borrowing is asked for the repayment of the above-named amount, which it is proposed to raise by the creation and issue of additional water stock or by bills. Among the miscellaneous provisions of the measure under notice is one by virtue of which the Board will cease to be liable, as successors in title to the New River Company or otherwise, to pay to the Corporation of Hertford the annuity of £600 referred to in section 103 of the Lea Conservancy Act, 1868; and, as from March 31, 1907, the lease granted by the Corporation to the Company is to be held null and void. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Urban District Council of New Mills are seeking authority to purchase the Ollerset Water-Works, as well as such portion of the works and plant of the Stockport Corporation as is within the area of the Council, and to supply water throughout their district. The first-named works were constructed under an Act passed in 1831, which empowered Mr. G. W. Newton to carry them out, and supply the hamlets of Beard, Ollerset, Thornset, and Whittle with water. The powers, rights, and privileges granted by the Act are now vested in Mr. F. J. Sumner, with whom the Council have entered into an agreement for their transfer; and its confirmation is sought by the Bill now being promoted. Should this receive the sanction of Parliament, the above-named Act will be repealed. The Corporation will sell the portion of their undertaking in the district of the Council in accordance with the provisions of the Lands Clauses Acts, subject to notice to treat being given within six months after the passing of the Act. When the purchase has been completed, no part of the Council's district will be within the limits of the Corporation. Powers are sought to make subsidiary water-works, and to acquire the rights of the Duchy of Lancaster in respect of a tunnel known as the "Gow" or "Jow" Hole tunnel. The rates to be charged for water to be used for domestic purposes are based on the rateable value of the premises supplied; and the meter rate is not to exceed 2s. per 1000 gallons. Provision is made for the sale of water in bulk. The Council seek power to borrow £7500 for the extension and improvement of their water-works; and for the purchase of the private undertaking, the specified portion of the Corporation's plant, and the acquisition of the rights of the Duchy of Lancaster, the sums requisite for these purposes—all to be repaid within fifty years from the date of borrowing. The provisions of the Bill as to the first-named purchases are to come into force (assuming they are sanctioned by Parliament) immediately after completion. [*Parliamentary Agents: Messrs. Lees and Butterworth.*]

By a Provisional Order granted in 1897, the Barton-upon-Humber Water Company, Limited, were authorized to maintain and enlarge certain works then existing, and supply water within the parishes or places of Barton-upon-Humber, Barrow, and Goxhill, in the parts of Lindsey, in the county of Lincoln. The capital of the Company was limited to £16,000, being £10,000 of original and £6000 of additional capital, carrying 10 and 7 per cent. maximum dividends; preference shares or stock to carry 6 per cent. The Company have raised all their capital and have borrowed £4000 on debentures. They are now seeking to be incorporated under the title of the North-East Lincolnshire Water Company, and to be authorized to include within their district a number of parishes and places specified; also to increase their capital to £36,000, of which the £16,000 just referred to is to be called the original, and the remainder the additional capital. The latter is to be put up to auction or tender, and any not purchased is to be offered to holders of ordinary shares. It is to be entitled to 7 or 6 per cent., according as it is issued as ordinary or preference. Borrowing powers to the extent of one-third (including the £4000 already raised) are asked for, as well as permission to create debenture stock. It is proposed to construct new works, consisting of a well and pumping-station in the parish of Hundleby, another in the parish of Alford, reservoirs at Raithby and Well, and two conduits or pipe-lines to connect the pumping-stations with the reservoirs—all to be completed within seven years from the passing of the Act. The charge for a domestic supply is to be based on the rateable value of the premises; and that for a supply by meter is not to exceed 1s. 6d. per 1000 gallons. The other provisions of the Bill include power to supply water in bulk, to make regulations to prevent its waste or misuse, and to sell the undertaking to the Local Authority. [*Parliamentary Agents: Messrs. Baker and Co.*]

The North Sussex Gas Company are applying for authority to supply water in the parishes of Billingshurst, Wisborough Green, Slinfold, and Kirdford, and a small portion of the parish of Pulborough, in the county of Sussex. The Company propose to construct a well, pumping-station, and service reservoir at Billingshurst, and they ask for a period of three years from the passing of the Act for carrying them out. Water will be supplied for domestic purposes at constant pressure, at charges based on the rateable value of the premises; for public and farming purposes, by meter or otherwise, at a price not exceeding 2s. per 1000 gallons, with a minimum in certain cases of 8s. a quarter. The capital sanctioned by the Act passed last session under which the Company was incorporated, and the borrowing powers, are to be doubled; and authority is sought to raise additional capital by ordinary or preference shares or stock, to carry interest at the maximum rate of 6 per cent. per annum. After the passing of the Act, the Company's name will be changed to the North Sussex Gas and Water Company. [*Parliamentary Agents: Messrs. Baker and Co.*]

A General Bill promoted by the Pontefract Corporation contains a part relating to water supply. The Corporation wish to be authorized to hold lands and execute works for the protection of their sources of water, and to make bye-laws for preventing pollution. It is specified in one clause that the rates for the supply of water are not to include fixed baths, for which a charge not exceeding 10s. per annum may be made; and in another that the term "domestic purposes" is not to include a supply to any large institution. Other provisions of the Bill relate to injuring meters and the notice to be given to the Corporation before their disconnection. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Portsmouth Water Company are applying for power to construct works, enlarge their limits of supply, and raise further capital. The new works are of an extensive character, comprising five pumping-stations, two service reservoirs, four aqueducts, and a similar number of adits or headings; and they will necessarily entail the acquisition of a large quantity of land, for which powers of purchase are sought. A period of ten years is asked for the completion of the works. The Company require authority to raise £225,000, the maximum dividend on which is to be 5 per cent. It is to be put up to auction or tender, and what is not disposed of is to be offered to shareholders. Borrowing powers to the extent of one-third of the additional capital will be applied for, as well as authority to create and issue debenture stock. The extended limits of supply will take in several parishes in the counties of Southampton and Sussex. The Bill includes provisions in regard to the charges for water and the pressure at which it is to be supplied in the area proposed to be added. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Rathmines and Rathgar Urban District Council are promoting a Bill for the extension of their boundaries; and as they are the suppliers of water, under their Act of 1880, they desire to have this privilege applied to the included area. At present it is within the water limits of the Corporation of Dublin; and the Council propose to purchase the mains, pipes, and other plant now in use, at such price, and on such terms and conditions, as may be agreed upon, or be determined by an arbitrator to be appointed by the Local Government Board. The price, if settled by arbitration, is to be the amount of the original capital outlay incurred by the Corporation in respect of the plant to be purchased. The sanction of the Board will be required for the raising of the money necessary for carrying the Act into effect; and the Council propose to repay it within such period, not exceeding sixty years from the dates of borrowing, as shall be fixed by them. [*Parliamentary Agents: Messrs. Holmes, Greig, and Greig.*]

Application is being made for an Act to incorporate the South Lincolnshire Water Company with powers of supply within certain parishes in the county of Lincoln, and to authorize the Company and the Spalding Urban District Council to construct the necessary works. The limits of supply include the portions of Holbeach, Fleet, Little and Long Sutton, and other parishes, lying to the north of the Bourne and Lynn line of the Midland and Great Northern Railway Companies. The capital of the Company is £30,000; and borrowing powers to the amount of one-third are applied for, as well as permission to issue debenture stock. The works which the Company propose to construct are two wells and pumping-stations at Bourne, two reservoirs, a pumping-station, and a water-tower at Weston, and a reservoir and water-tower at Little Sutton; those to be undertaken by the District Council are a conduit or pipe-line commencing at the Council's new well at Bourne, and joining another running from the Company's well and their pumping-station in that parish and terminating in the parish of Pinchbeck—the whole to be completed within seven years from the passing of the Act. The Bill contains the necessary provisions to enable the Company to take and use lands and waters; and also others whereby the Council may acquire from the Company certain lands and works, raise the necessary money, and apply their funds for the purposes of the Act. The water is to be constantly supplied under pressure, at charges based upon the rateable value of the premises; but for other than domestic purposes the price is not to exceed 2s. per 1000 gallons, with a minimum of 10s. per quarter in the case of large institutions. Provision is made for affording supplies in bulk. The Company will ask for power to purchase by agreement the undertaking of the South Lincolnshire Fen Water Company. The other provisions are those usually found in Water Bills. [*Parliamentary Agents: Messrs. Baker and Co.*]

In a General Bill promoted by the Todmorden Corporation, power will be sought to acquire additional lands for the further protection of their waters and water-works against pollution, encroachment, or injury, and to make bye-laws for the prevention of waste. For the first-named purpose, the Corporation seek authority to borrow £11,000, to be repaid within sixty years from the time of obtaining the money. [*Parliamentary Agents: Messrs. Sharpe, Parker, Pritchards, Barham, and Lawford.*]

The last Bill to call for notice is one which has been promoted to authorize the construction of additional works and the abstraction of water from the River Bure for the purpose of affording increased supplies by the Great Yarmouth Water Company and the Lowestoft Water and Gas Company, and to confer further powers on these Companies. The former Company propose to construct a line or lines of pipes commencing in the parish of Horning, at a point on the left bank of the above-named river, and terminating at the existing pumping-station; also a pumping-station near the intake, with subsidiary works, in the parish mentioned. These works are to be completed within seven years from the passing of the Act. The Company ask for power to acquire additional lands at Horning, Ranworth, and Gorleston. The Bill includes provisions for a supply of water between the Companies; and the Yarmouth Company are to serve Lowestoft. This Company apply for permission to raise additional capital to the extent of £50,000, and the Lowestoft Company to an amount not exceeding £100,000, to be entitled to 7 per cent. dividend if ordinary, or 6 per cent. if preference; with borrowing powers of not more than one-fourth. The Bill contains the usual auction clause; and the others are of the kind generally found in Water Bills. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

THE MIDLAND JUNIOR GAS ENGINEERING ASSOCIATION.

A Meeting of this Association was held in Birmingham on Saturday—the chair being occupied by the Senior Vice-President (Mr. G. W. G. Tatam), in the absence of Mr. Bywater—when the following paper was read by Mr. J. H. Willoughby, of Leamington, entitled

CYANOGEN RECOVERY.

The history of nearly all commercial processes shows us how rarely success is at once attained; the skeleton cupboard of the manufacturer containing many gruesome records of hard-fought struggles and failures before the discovery of some small alteration in the process has elevated it from the depths of mediocrity to the heights of success. When in the future the history of cyanogen recovery comes to be written, it will be found to be no exception. Some fifteen years ago, the attention of those controlling the gas industry was directed to the modern processes of gold recovery; for by watching the progress of the various methods of extracting gold, they were able to anticipate the probable demand for cyanides. This sufficed to put them in a position to judge the extent to which the extraction of cyanides from coal gas would be advantageous to their works. Nor were they alone in the market; for it was necessary to keep a sharp eye on numerous systems for the production of cyanides from atmospheric nitrogen and ammonia. Several of these processes were commercially successful; and gas makers found that they no longer had a monopoly of suitable raw material for the manufacture of cyanides on a large scale.

Time alone would prevent my giving a detailed description of all the systems at work about this period; but the extent and the virulence of the competition which the gas manager had to face was well indicated by the fact that a process for the formation of cyanide in the electrical furnace was in use about this time (1894). According to the specification issued, the oxide or carbonate of one of the metals of the alkalies or alkaline earths is well mixed with about one-fifth part of its weight of charcoal, and passed into a carbon-lined electrical furnace, into which nitrogen is led. The cyanide formed is run off through a tapping outlet into a vessel protected from the air; and any cyanide which volatilizes and passes off with the exit gases is recovered from the latter. This process thus appears to be simple synthesis of cyanide from carbon and nitrogen in the presence of whatever base is required in the commercial product.

In coal gas, however, the cyanogen molecule exists; and its formation has entailed no special expenditure. The problem of extraction and conversion to marketable products alone have to be faced. The initial difficulty of uniting the carbon and nitrogen into cyanogen has been overcome in the retort and hydraulic main; and in this respect the gas manager has, in common with the superintendent of other works where coal is subjected to destructive distillation, an advantage over all other producers of cyanides. He merely separates the cyanogen in a convenient form from the heterogenous mixture in which he finds it, and then converts it to a suitable compound for sale. Potassium cyanide has hitherto been most largely used in the goldfields, though sodium cyanide has also been employed, and has the distinct advantage of containing a higher percentage of cyanogen.

Sources of Cyanogen.

Before proceeding with the different processes for the recovery of cyanogen, it will be as well, perhaps, if I explain to you briefly the sources of cyanogen. In taking the products formed by the distillation of coal, we find there are only three which are of any interest to us in dealing with the cyanogen recovery. These are: (1) The gas made from the coal; (2) the ammoniacal liquor; and (3) the spent purifying material. I do not intend to deal with these three sources in detail, but shall ask your attention to the remarks I may make in dealing with the first of these sources—viz., cyanogen recovery from coal gas—while the other two I shall touch but slightly. Before, however, I proceed with this subject, I think it will form an instructive preface if I briefly bring to your notice the various theories put forward, and also endeavour to show what are the reactions which may be determined with regard to the formation of the cyanogen compounds in the manufacture of coal gas.

In England, and also in Germany, the subject of the recovery of the cyanogen compounds has attracted much close study; and manufacturers and scientists have advanced various theories with regard to the formation of the cyanogen compounds, and have endeavoured to show what are the reactions which may determine it. They have pointed out that cyanogen compounds are formed naturally in the above-named process, and may be met with in the various operations in the following forms: Cyanogen, sulpho-hydro-cyanic acid, hydrocyanic acid, cyanide, ferrocyanide, and sulphocyanide of ammonium. The nitrogen requisite for the formation of these compounds originates in the coal, which contains various proportions according to its species, and may be said on an average to be from 1 to 1·60 per cent. The operation of distillation distributes this nitrogen among the various products; and only a small quantity is found as cyanogen compounds.

I am unable to give you the results of all the experiments on the distillation of coal and the migrations of nitrogen, but have taken the figures supplied by the late Professor Foster as giving a very fair average. His experiments dealt with coal containing 1·73 per cent. of nitrogen; and he found of this quantity 0·251 per cent. passed to the state of ammonia, 0·027 per cent. to the state of cyanogen, 0·863 per cent. remained in the coke, and 0·589 per cent. passed to the tar and gas. Or, to explain more fully, if we represent the total nitrogen by 100, then the quantity passing to cyanogen would be 1·56 per cent. This shows that the percentage of cyanogen compounds is low; and it is only by dealing with large quantities of coal that the treatment is rendered profitable. Also the proportion depends very largely on the temperature of distillation; cyanogen only being engendered in brisk distillations at a high temperature. It has been experimentally demonstrated that the main portion of the cyanogen is formed towards the end of the distillation, when the temperature is greatest; the amount of ammonia produced at this time being very slight. A small percentage of cyanogen, therefore, always corresponds with a high percentage of ammonia; and the reverse is also true, that a high percentage of cyanogen corresponds with a low percentage of ammonia.

I believe that I am right in saying that the state in which the cyanogen leaves the retorts has caused much discussion; and opinions vary greatly. Some authorities maintain that it exists in the gas as cyanide and sulphocyanide of ammonium, which, meeting with sulphur and sulphide of carbon in the retort at a high temperature, would be partially transformed into sulphocyanide of ammonium. Others, again, have clearly demonstrated by experiment that the action of ammonia on carbon or carbonic oxide at red heat does not give cyanide of ammonium, but hydrocyanic acid. This would mean that the cyanogen in the gas cannot exist there except as free cyanogen or as free hydrocyanic acid. Other authors admit that cyanide of ammonium is formed, but that it is decomposed by the carbonic acid contained in the gas, which would produce hydrocyanic acid and carbonate of ammonia. However it may be, they are all prepared to admit that the formation of cyanogen compounds takes place in the retorts at a high temperature, and probably results from the action of ammonia on carbon or carbonic oxide—an action which determines the formation of free hydrocyanic acid, which during its migrations through the various appliances is transformed.

Again, if we take the cyanogen found in ammoniacal liquor, we are told that it exists chiefly in the form of ferrocyanide and sulphocyanide of ammonium—the latter being only rarely met with. Ferrocyanide of ammonium is said to be due to the action of free hydrocyanic acid in the presence of ammonia on sulphide of iron; the sulphide of iron being produced by the action of sulphuretted hydrogen on the iron frame of the condenser. The formation of the sulphocyanide of ammonium is somewhat obscure; but it is thought by many to be caused by the reaction of sulphide of carbon on sulphide of ammonium, the sulphide being itself produced by the action of the sulphur of the pyrites contained in the coal on the carbon at a distillation temperature.

In the case of the spent purifying materials, we find the cyanogen almost completely retained in the purifying materials. It is easy to see that, after the passing of the gas into the first purifier, the amount of cyanogen products contained in the gas, which previously varied very little, decreases considerably, and that it is in the first purifier that the principal proportion of the cyanogen products are really formed. If we take the purifying materials to consist of a mixture of ferric hydrate and sulphate of lime, obtained by the reaction of lime on ferrous sulphate, and the gas entering the purifiers to contain the usual impurities—such as sulphuretted hydrogen, ammonia, and cyanogen compounds—then somewhat complex reactions take place between the purifying materials and these impurities; and, in particular, ferrous cyanide, ferrocyanide of iron, and ferrocyanide and sulphocyanide of ammonium are formed. Here, again, opinions differ; and the formation of the ferrocyanide is explained in various ways. The hydrocyanic acid is supposed to act on the iron oxide to form ferrous cyanide, which, in the presence of the oxygen of the air, is transformed into prussian blue. While, again, other authorities admit that the ferrous cyanide results from the action of cyanide of ammonium on oxide or sulphide of iron; and if the cyanide of ammonium is in excess, there is formation of ferrocyanide of ammonium. However this may be, the prussian blue is not formed direct in the purifier, but by oxidation of the ferrous cyanide. One important point that I should like to mention is that humidity or the employment of steam is said to favour the formation of ferrocyanides, while the presence of ammonia prevents it—thus showing the necessity of washing the gas free from ammonia by those who wish to obtain a large percentage of ferrocyanide in their purifying materials.

As you will now be able to understand from the few brief remarks I have made about the cyanogen reactions which accompany the formation of the cyanogen compounds, both in the gas itself and in the ammoniacal liquor and purifying materials, their production is closely connected with many conditions which those interested in cyanogen recovery and who are desirous of recovering the cyanogen should endeavour to avoid or to bring about, according as they are or are not favourable for so doing.

Manufacture.

There are at present three systems of manufacture of cyanides on a commercial scale: (1) Transformation of ferrocyanides into cyanides by alkaline metals or their alloys. (2) The synthetic

process, by the action of atmospheric nitrogen upon carbon in the presence of an alkali or an alkaline metal, or by the action of ammonia on an alkaline metal alone or mixed with carbon. (3) The extraction of cyanides as bye-products in the manufacture of coal gas. The cyanogen compounds are found ready formed in coal gas in varying low percentages—in some almost down to zero. Moreover, cyanogen is a destructive product, from which the coal gas should be freed before it is supplied for consumption; and consequently there is a necessity, as well as an advantage, in extracting it, which can be done the more easily as it forms naturally during the process of manufacture.

The following sketch of the process by which the cyanide of one of the alkalies may be produced from ammonia and bisulphide of carbon is taken from papers by Mr. J. T. Conroy, published in the "Journal of the Society of Chemical Industry." He says:

A class of synthetical processes for the manufacture of cyanides, to which several commercially successful schemes belong, take the nitrogen of ammonia instead of free nitrogen as the source of the nitrogen of the cyanogen molecule. It appears to be generally conceded that the production of cyanide from ammonia is most readily and economically carried out through the intermediate formation of sulphocyanide. Ammonia interacts with carbon bisulphide and yields ammonium sulphocyanide and ammonium sulphide. If hydrated lime be present, calcium sulphocyanide is obtained, and the pressure of the reacting gases is considerably reduced. Under carefully regulated conditions of temperature, the yield of sulphocyanide will be almost that indicated in the following equation, in which the intermediate products are passed over for the sake of showing simply the ultimate source of the reaction. It is essential that ammonia be present in excess of the quantity shown in the equation:

$$\underset{\text{(1:2 parts ammonia)}}{6NH_3} + \underset{\text{(152 parts carbon bisulphide.)}}{2CS_2} + \underset{\text{(74 parts hydrated lime.)}}{Ca(OH)_2} =$$

$$\underset{\text{(156 parts calcium sulphocyanide.)}}{Ca(CNS)_2} + \underset{\text{(136 parts ammonium sulphide)}}{2(NH_4)_2S} + \underset{\text{(36 parts water.)}}{2H_2O}$$

The ammonia of the ammonium sulphide is easily recoverable; and thus it is clear that the 156 parts of the calcium sulphocyanide can be obtained from an actual expenditure of only 34 parts of ammonia. In practice, it is usual to have an excess of lime, which uses up all the ammonia. According to some processes, iron or manganese (in the form of Weldon Mud) is introduced to take up the sulphuretted hydrogen; but the use of these materials appears to be unnecessary, provided proper conditions of temperature and proportions of ingredients be observed.

The next step is the conversion of the calcium sulphocyanide to cyanide; and for years manufacturers have failed to achieve this with economy. Recently, however, some promising processes have been devised. The methods in which sulphocyanide is fused with iron or zinc in a reducing atmosphere give some fairly good yields of cyanide, with sulphide of iron or zinc as a bye-product. There are, however, many difficulties, I believe, in these methods and several attempts have been made to effect the conversion in the wet way. A temperature of 285° to 300° Fahr., or a pressure of 45 to 50 lbs. of steam, effects conversion in a closed vessel.

The calcium sulphocyanide obtained by the method I have previously described, or by other commercial processes, is mixed with concentrated ferrous chloride and some finely divided iron, preferably obtained by reduction of the oxide. The reaction appears to take place as follows:—

$$\underset{\text{(156 parts calcium sulphocyanide.)}}{Ca(CNS)_2} + \underset{\text{(127 parts ferrous chloride.}}{FeCl_2} + \underset{\text{(112 parts iron.)}}{2Fe} =$$

$$\underset{\text{(108 parts ferrous ferrocyanide.)}}{Fe(CNS)_2} + \underset{\text{(176 parts ferrous sulphide.)}}{2FeS} + \underset{\text{(111 parts calcium chloride)}}{CaCl_2}$$

The ferrous ferrocyanide and ferrous sulphide form a black precipitate, while the calcium chloride goes into solution. The precipitate is attacked by caustic alkalies, and yields a soluble alkaline ferrocyanide and insoluble sulphide of iron. There is, however, a considerable loss of alkali, which forms an insoluble compound with the sulphide of iron. The loss is said to amount to about 22 per cent. of the alkali when caustic soda is used. By filtration from solid matter, a solution is, however, thus obtained, which gives crystals of sodium ferrocyanide. The sodium ferrocyanide is duly dehydrated by heating, and converted to cyanide by smelting with metallic sodium, or by some other of the numerous methods for the conversion of ferrocyanides to cyanides. This method was brought into general notice a few years ago by the death of a workman at the Beckton Chemical-Works. While engaged at his duties, he was, with another workman, making cyanide of potassium, which is done by putting potassium ferrocyanide and sodium into a crucible. After it is heated, it is beaten up with a bar. The crucibles were 11 inches wide and about 4 feet deep. Just after the workman had swept into the crucible the stuff which had come off his bar, his companion heard him loudly scream, and on turning round saw him drawing his leg out of the crucible into which he had evidently stepped. He was taken in an insensible condition to the Seamen's Hospital, where he died from the effects of burns and the absorption of potassium into the system.

In tracing through the back numbers of the "JOURNAL OF GAS LIGHTING," I find that, in the processes by which potassium or sodium cyanide may be produced from the cyanogen of coal gas, nearly all aim at the production of ferrocyanide without the intermediate formation of sulphocyanide. The conversion of ferrocyanide to cyanide I have already described; and therefore the cost at which ferrocyanide can be produced will show at a glance whether the manufacture of cyanide from ammonia and carbon bisulphide will likely render the manufacture of it on a gas-works unremunerative. For the production of ferro-cyanide from the cyanogen of coal gas, the only raw materials absolutely necessary are some suitable compound of iron and the alkali or base of the ferrocyanide, which is the final product, although we find a very large volume of the gas has to be dealt with for a very small yield of ferrocyanide, and the gas contains compounds which interfere with the activity of the materials used for abstracting cyanogen.

I am unable to give you any figures gained by actual experience; but I believe, on a practical scale, 1000 cubic feet of gas from Durham coal will yield only about 0·30 to 0·40 lb. of potassium ferrocyanide, and therefore about 10,000 cubic feet of gas have to be handled to secure the production of 3 to 4 lbs. of potassium ferrocyanide. If the cyanogen in the gas is abstracted in the ordinary washer-scrubber, by the addition of some iron salt to the liquor therein, it is claimed that no additional outlay on plant is needed for handling the gas; but I fail to see how one is to recover the ammonia from the sludge without the help of an additional washer. Sulphuretted hydrogen in the gas and liquor causes the formation of ferrous sulphide, and to a certain extent I believe renders the iron salt inert. Moreover, the ferrocyanide thus obtained in the liquor is associated with such a number of ammonium compounds that its separation in a state of purity is said to be a very difficult matter. The ferrous sulphide which settles from the liquor also has some cyanogen compound associated with it—probably the compound is the ferrous ferrocyanide referred to in connection with the synthetical process of production from ammonia and carbon bisulphide. Notwithstanding the complexity of the liquor obtained by the simple addition of an iron salt to the washer-scrubbers, we are told that the recovery of its ammonia and cyanogen was for a few years carried out with some measure of success in London works. By one method the ferrocyanide in the liquor is converted to prussian blue, and thence potassium or sodium ferrocyanide is obtained. A curious fact generally noticed was that the ferrocyanide in the liquor from the washer-scrubber slowly passed out of solution, and it appears was converted into the insoluble compound of iron I previously referred to.

Another method, which was patented by Mr. William Foulis in 1892, and, with modifications, still further protected by Messrs. Foulis and Holmes in 1895, was much used in many gas-works in the North. The prominent features of this system are that the gas is washed and scrubbed in the ordinary way before it is treated for the extraction of cyanides, and that the absorbing agent used is a solution of alkaline carbonate containing carbonate of iron in suspension. Therefore, the nature of the ammoniacal liquor made is in no way interfered with, and the alkaline ferrocyanide which is produced in the absorbent, is relatively free from any contamination. On the other hand, a specially prepared carbonate or oxide of iron and alkali are required. But since in the systems I have brought to your notice iron and alkali must be introduced at some stage of the manufacture of alkaline ferrocyanide, there appears to be little or no loss of economy by adopting the special absorbent in place of other preparations. The only point in which I think the method compares unfavourably with the process in which an iron salt is introduced into the ordinary scrubber-washer, is that a special washer-scrubber or similar apparatus is necessary for treating the gas with the absorbent. Some additional capital outlay is thus required; and there is the continual expenditure of power needed for driving the apparatus or for forcing the gas through it. These items probably add an appreciable burden on the system, though the relatively high degree of purity of the crude ferrocyanide obtained probably more than counterbalances it. The absorbent, when it has taken up its complement of cyanogen from the gas, is evaporated to a cake, which is then extracted with water, and the alkaline ferrocyanide is obtained from the extract by crystallization. No such simple process of extracting the ferrocyanide is possible if the cyanogen of the gas is absorbed in the ordinary washer-scrubber. On the other hand, a certain percentage of the cyanogen is said to be lost owing to its absorption by iron being deferred until after the ammonia has been removed from the gas. The ammonia carries with it into the ordinary liquor a proportion of the cyanogen of the crude gas, and it appears in the liquor chiefly as sulphocyanide. When an iron salt is introduced into the ordinary washer-scrubber, less sulphocyanide will be found in the liquor than when the iron salt is absent.

All the early investigations made, and the majority of the schemes for removing cyanogen from coal gas, have so far aimed at the direct production of ferrocyanides, and regarded sulphocyanide, whenever formed, as being a waste product. The ease with which the cyanogen of the crude gas will pass into sulphocyanide; and the readiness with which the ammonia and carbon bisulphide combine in the presence of certain bases to form sulphocyanide, suggested that the production of cyanides from coal gas might be successfully carried out through the sulphocyanides. This led to some investigation, which showed that calcium sulphocyanide, or any soluble sulphocyanide, may be converted with trifling loss to tolerably pure ferrocyanide. This caused manufacturers of cyanides from other raw materials almost without exception, to produce a sulphocyanide, and therefrom obtain ferrocyanide or cyanide.

I am not prepared to follow the fluctuations in the market prices of the various cyanogen products during the past few years; but I may briefly state, in passing, that the sulphocyanides have not suffered depreciation to nearly the same extent as cyanides and ferrocyanides. The disastrous effects on prices caused by over-production may be well known to many of you; and the reason why potassium sulphocyanide did not lose value to the same extent as potassium cyanide and potassium ferrocyanide, is, I think, explained by the increasing use of sulphocyanides for the production of ferrocyanide and cyanide. As an example, I would explain that the value of 1 lb. of cyanogen in the different potassium salts shows the increasing relative worth of the sulphocyanides. At the close of 1894, we find that the amount of potassium cyanide which contained 1 lb. of cyanogen cost 5s. 5d.; two years later, it cost only 2s. 5d. At the same dates, we find that the corresponding amount of potassium ferrocyanide which contained 1 lb. of cyanogen cost 2s. 3d.; two years later, it cost 1s. 2¼d. This shows that a considerable loss must have occurred at both dates in the conversion of the ferrocyanide to cyanide. Now at the close of 1894, the amount of potassium sulphocyanide which contained 1 lb. of cyanogen cost 2s. 2½d., while some two years later it cost 2s. 1d.; thus clearly indicating that the value of the cyanogen in the form of sulphocyanide has fallen off but little, while that of the cyanogen in the form of cyanide and ferrocyanide has dropped immensely.

How far we are indebted to the inflated values of cyanide and ferrocyanide about the year 1894 for the increased interest taken in cyanogen recovery, I am unable to say; but it is a fact that about this time the demand was much greater than the supply, which was doubtless owing to the progress thus far made in the cyanide process for the extraction of gold. This system, although patented in October, 1887, did not, I believe, commence working in the Transvaal until 1890. In 1891, the total production of gold by the cyanide process is returned at only 35,000 oz.; whereas the estimated production by the process in 1897 was 1,215,000 oz. of fine gold, or over 10 per cent. of the world's production. Also, to quote another authority, in 1889 the world's consumption of cyanide of potassium did not exceed 50 tons per annum. At present, the entire consumption of cyanide is not much short of 10,000 tons a year, of which the Transvaal goldfields consume about one-third. These figures will probably explain the inflated values I have just referred to.

The Plant at Leamington.

Having thus far brought to your notice some of the methods employed in the recovery of cyanogen in the form of ferrocyanide and cyanide, and also having shown how the sulphocyanide of ammonium, instead of being recognized as a waste product, began to be manufactured as a means therefrom to obtain ferrocyanide or cyanide, I would introduce the system which during the past two or three years has become generally adopted—I allude to the process of the British Cyanides Company, Limited, of Oldbury, which process we have worked at Leamington since the month of September, 1903. [An illustrated reference to this plant appeared in the "Journal" for May 23 last, in connection with the visit to Leamington of the Midland Association of Gas Managers; while the installation under the same system at Walsall was similarly noticed when the Association went to that town—see "Journal" for Oct. 27, 1903.]

As we have found better results in the working of our cyanide washer since the introduction of the tar-extractor, it will perhaps be as well if I commence by briefly describing the tar-extractor to you. It was made and fixed by Messrs. W. C. Holmes and Co., of Huddersfield; and the apparatus may be said to be constructed with two or more concentric tar-cups and a corresponding number of gas-passages and concentric counterbalanced regulating and tar-extracting drums, having walls built up of perforated plates. Also the counterbalanced drums are provided with relief valves, which are normally held closed against the pressure of the gas by springs, but which engage with stops, and are opened thereby should the drum descend too far and the resistance of the springs be overcome by the unbalanced weight of the drum—as, for example, should the supporting rope or chain break.

After leaving the tar-extractor, the gas passes into the cyanide washer, which was also made and fixed by Messrs. Holmes and Co. It is designed to pass 100,000 cubic feet of gas per hour, and is divided into nine bays, in eight of which are placed brushes which revolve on a central shaft driven by power from a steam-engine, while in the ninth bay, which is placed intermediate, is fixed a bearing for supporting the central shaft. Over each of these eight bays in which the brushes revolve is fixed a large conical cup, which has a close-fitting lid, held in position by a moveable clip and hand-screw. It is separated from the bay by a full-way tap.

Ammoniacal liquor of about 5° Twaddel is pumped into the washer at the outlet end, and is made stronger by absorption of part of the free ammonia as the liquor flows in a contrary direction to the gas; while granular sulphur is introduced into the eight bays by closing the full-way tap and removing the clip and lid over the cup. After filling, the lid and clip are again placed in position, and the full-way tap opened, which allows the sulphur to fall upon the revolving brushes. To prevent the liquor escaping in too weak a condition, the overflow is regulated by a valve, through which it passes to the storage tank. This storage tank is of sufficient capacity to hold practically two boat-loads of the ammonium sulphocyanide; and it is emptied by pumping into boats to be conveyed to Oldbury.

To keep the washer in a proper condition for the absorption of cyanogen, it is necessary to ascertain if there is sufficient polysulphide of ammonium in the washer. This is done by running off some of the strong liquor into a beaker and adding a little dilute sulphuric acid. A yellow precipitate denotes the presence of polysulphide. Should there be no precipitate, however, more sulphur is required in the washer. This is generally explained by the following:—

$$S + Am_2S + Am_2CO_3 = Am_2S_2 + Am_2CO_3$$

The granular sulphur is dissolved, and unites with the ammonium sulphide (Am_2S) in the liquor to form ammonium polysulphide (Am_2S_2). When one has obtained the necessary polysulphide and is in a position to absorb the hydrocyanic acid in the gas, the following reaction takes place:—

$$2\,Am_2S_2 + Am_2CO_3 + 2HCN = 2AmCNS + 2\,Am_2S + CO_2 + H_2O$$

This is explained as follows: The ammonium polysulphide (Am_2S_2) unites with the hydrocyanic acid (HCN) forming ammonium sulphocyanide (AmCNS) and ammonium sulphide (Am_2S), liberating carbonic acid and water.

Frequent samples are taken while the liquor is being pumped from the storage tank into the boat, after which the samples are well mixed together in a bucket, and not less than three 8-oz. bottles are filled, which are carefully sealed and labelled, one of which is forwarded with the boat, while another is tested, and the third is kept for further reference. The sample to be tested is dealt with as follows: As to ammonia: This is determined by distilling a known quantity of the sample with a small excess of caustic soda or potash in the manner employed for determining the total ammonia in gas liquor. The result is then calculated as ounce strength. As to sulphocyanide: From 1 to 2 cubic centimetres of the sample are treated with lead carbonate to remove any sulphide. The liquor is then filtered, the precipitate washed with distilled water, and the combined washings and filtrate precipitated in hot solution with copper sulphate and sulphurous acid, and the resulting cuprous sulphocyanide filtered off, washed, and decomposed with a solution of pure caustic soda or potash. The mixture thus obtained is filtered off, the precipitate washed, and the combined filtrate and washings acidified in the cold with dilute nitric acid; a little ferric sulphate is added; and the solution is then titrated with decinormal silver nitrate solution until the red colour of ferric sulphocyanide just disappears. The result is calculated as pounds of ammonium sulphocyanide (AmCNS) per gallon of liquor.

I am not in a position to lay before you a lot of figures showing the profit and loss on our cyanide undertaking; but when I tell you that the plant cost £950, and that since we commenced working in September, 1903, until the present time (about 2 years and 6 months), we have received the sum of £374 4s. 5d. for the cyanogen recovered, also that we reckon the slight cost of steam and the workman's time in oiling the engine and filling the cups with sulphur to be paid for by the increased area of purification, you will readily understand that we consider cyanogen recovery capable of paying a good return for the capital invested.

In conclusion, I have read somewhere that "When Nature desires to train a man, she does not send him to the 'varsities, but to the necessities;" and I think that much of the rising gas engineer's education will have to come from the same seat of learning—that there is still much to be achieved and valuable information to be obtained regarding this (shall I say) latest source of income from the waste products of coal gas. It has been computed that the gas-works of the United Kingdom should be equal to meeting two-thirds of the world's requirements. But, unless the recovery of cyanogen be carried out with the utmost economy and technical skill, the gas-works production will be entirely subordinated to that of modern synthetical processes. In other words, they may let slip the opportunity of controlling an industry capable of earning for them an annual turnover of some £300,000. If they do so, it will be chiefly from lack of the technical assistance which the rival processes of production have secured at considerable outlay. The carbonization of coal furnishes a certain amount of cyanogen, which has merely to be separated and converted into commercial products. In nearly every other known method of manufacturing cyanides, the difficult problem of producing the cyanogen has to be solved. It seems, therefore, unreasonable that the gas manager with the assistance of skilled chemists should not be able to make the extraction of cyanogen from coal gas a more remunerative industry than the manufacture of cyanides by the synthetical process; and there appears to be no sufficient reason why the gas manager should despair of holding his own in cyanide manufacture, or, in other words, in a profitable return for capital invested in cyanogen recovery.

Discussion.

Mr. Tatam remarked that he was sure they would all agree with him that the paper was a very good one indeed, and well worthy of discussion.

Mr. C. Meiklejohn (Rugby) said that he was somewhat disappointed that Mr. Willoughby had not given them more certain results as to the financial value of the process referred to. He understood that when the solution of ammonium sulphocyanide was sent to the alkali works it was worked up to some 20° or 24°

Twaddel, and that a very large proportion of ammonia went in that solution. If the gas-works were making sulphate of ammonia, they must have a loss in this direction to set against the gain in cyanide. He did not remember that Mr. Willoughby had said anything about the quantity recovered per ton of coal; but he believed it was originally claimed to be from 4 to 6 lbs. per ton carbonized. Perhaps they might have some information from the author on this point. As to the actual amount of money obtained from the process, everything depended on how much was needed to cover interest on the capital outlay and the loss represented by the ammonia sent away direct in solution. The paper was a welcome addition to the transactions of the Association; and he therefore had much pleasure in proposing that a hearty vote of thanks be accorded Mr. Willoughby for presenting it to them.

Mr. S .T. SMITH (Walsall), who seconded the resolution, said there were a few questions he should like to ask. In the first place, speaking about the recovery of cyanide in spent material, Mr. Willoughby had stated that allowing ammonia to go forward prevented the formation of ferrocyanides; but he (Mr. Smith) differed to a certain extent with this idea, and presumed Mr. Willoughby referred to the passing of large quantities. He found with oxide purification, in extracting the cyanide with the oxide instead of the sulphur, the ammonia rather helped the oxide in its work, and livened it up. In the sulphocyanide process the author said he used strong liquor for his cyanide washer. He (Mr. Smith) presumed he had another washer afterwards; otherwise there would be great difficulty in extracting the ammonia. From his equations, he showed that carbonic acid was liberated during extraction. Had he found any increase in his purification from that source? They were working the same system at Walsall; and they had not noticed any increase in their lime purification for the extraction of carbonic acid. He should also like to know whether Mr. Willoughby experienced any difficulty with the increase of carbonic acid affecting the recovery of the cyanogen. He would be pleased to hear an answer to the question put by Mr. Meiklejohn, as to the quantity of cyanogen recovered. Could Mr. Willoughby give him the amount of sulphur added in practice, as compared with the theoretical quantity required for the extraction of the cyanide?

Mr. W. E. CATON (Derby) also wished to know the quantity of cyanogen that Mr. Willoughby recovered per ton of coal. Was it about the same as he found in his tests? They had made several tests at Derby; and they got from 3½ to 7 lbs. of cyanogen per ton—the average being about 5 lbs. Was this result arrived at in practical working?

Mr. C. H. EDMONDS (Windsor Street) agreed with much that had been said; but he could not help wishing that Mr. Willoughby had criticized a little more sharply the various methods he had discussed. In one of his equations, he mentioned a certain loss of ammonia; but if it was worked out it would be found that this loss was 40 per cent. Was the calcium sulphocyanide recovered going to make up for this loss? He should rather question it. In the practical working of the Foulis method there were several disadvantages. In dissolving the scrap iron, it was very often four or five days before the acid was thoroughly neutralized by the iron; and it could not be put in the scrubber, because of the loss of sodium carbonate, which would be taken up in neutralizing the free acid. Another disadvantage of the Foulis process was that from 10 to 20 per cent. of the cyanogen in the gas passed away at the outlet of the scrubber. Mr. Willoughby discussed the effect of temperature on the production of cyanogen, and quoted Professor Foster's figure of 1·56 per cent. of the total nitrogen contained in the coal as being converted into cyanogen. It would be very interesting to have some figures regarding the practice in Continental gas-works. M. Guéguen had stated that in several German gas-works tests had been made, with the result that 29 per cent. of the nitrogen in the coal was shown to go to form cyanogen. This large increase in the percentage of cyanogen was attributed to the fact that on the Continent much higher heats were employed for carbonization. Tests were also made at one of the Birmingham works; and it was found that an increase of 100° in the temperature of carbonization caused the amount of cyanogen formed in the gas to be nearly doubled. From this it would appear that the temperature at which the coal was carbonized had a very important bearing on the quantity of cyanogen. He was rather disappointed that Mr. Willoughby, after discussing the Foulis process, did not refer to another method, in which the sodium alkali was replaced by lime. The lime was about sixteen times as cheap as soda; and besides this the alkali would be acting as a partial purifying agent. Thus there would be the additional advantage of a reduction in the purifying charges through employing the process in which lime was used as the alkali.

Mr. TATAM said that he was cordially in agreement with Mr. Meiklejohn and the other speakers with reference to the paper. Undoubtedly, it was a very good one. Mr. Willoughby had put things very clearly, and had gone into the matter more or less thoroughly; but he thought, as one member had already remarked, that the various processes might have been discussed a little more fully. These methods—the Bueb, the Foulis, or whatever system it might happen to be—all had their peculiarities. For instance, in the Foulis system Mr. Edmonds had mentioned that from 10 to 20 per cent. of the cyanogen in the gas passed away at the outlet of the scrubber. As a matter of fact, this was the case; but it was merely a question of regulation of the solutions and their temperature, as to whether this amount was reduced to 5 per cent. or less in working. The Wilton system was a modification of the Bueb process; and with it they had had 4 lbs. of cyanogen, reckoned as prussian blue, going into the scrubber, and 6 lbs. passing at the outlet. He might mention that they used a tower scrubber, with Walker's troughs at the bottom. In this way, it would seem that they were not only losing the cyanogen going in, but they were also denuding the solution of 2 lbs. This to a large extent was due to temperature, and also to the amount of ferrous salt in the solution. They ought to be very careful to keep the temperature of the solution low, and see that it was agitated as much as possible, in order that the ferrous sulphide, which was essential for the operation, should be kept in suspension in the solution. Under these conditions, they found they could limit the loss to ¼ lb. With either the Bueb or the Foulis process, there would be a loss of cyanogen at the outlet unless these conditions were adhered to. There was another feature which was rather against these processes—the formation of the insoluble ferrocyanides. He referred to the insoluble ammonium ferrous ferrocyanide. This was a very insoluble compound indeed, and was formed in the presence of large excess of iron. Once it was formed, it required a boiling heat in the presence of a fixed alkali to break it down to the ferrocyanide. He had seen samples of liquor containing 0·8 lb. of prussian blue per gallon; and these samples had contained up to 0·5 lb. out of the 0·8 lb. of prussian blue in the mud, where it existed as the insoluble compound above mentioned. So that, if the mud came to be filtered off, and only the liquor was used, about 60 per cent. of the cyanide was lost. Thus there again there was a disadvantage to any of the processes in which there was an alkali in the presence of a ferrous salt. A system which Mr. Willoughby did not mention was the Davis-Neil process, which was designed to overcome the loss due to the formation of the insoluble compound. In this case, they treated the whole of the material generally with boiling soda, and so broke down this insoluble salt; but even then the recovery of the ferrocyanide was very difficult to attain economically. He was in agreement with Mr. Smith on the point that ammonia certainly did aid in the retention of the cyanogen in the purifier-boxes containing oxide. If they had a lot of ammonia going forward, and no cyanogen process in operation, they found this tended to go to the formation of blue oxide in the boxes. Mr. Willoughby also spoke about synthetical processes; but these were not altogether a success. For instance, take the formation of the barium cyanide, where a mixture of barium oxide, together with charcoal, was subjected to heat in the presence of nitrogen or ammonia. The temperatures there, and also the condition of the gases, had to be so carefully regulated that the process, except in one or two works, was by no means a success. Then, coming to the sulphocyanide process, he certainly agreed with Mr. Willoughby that it was the ideal process, because it not only took from the gas the cyanogen, but under suitable conditions (which he believed had not been strictly determined) it removed a certain amount of the sulphur compound—that was, the carbon bisulphide. No doubt many of the members had noticed, from the "JOURNAL OF GAS LIGHTING" lately, that the Tottenham Gas Company had been having a row about their sulphur clauses. He thought they were relying to a great extent on the sulphocyanide process to reduce their sulphur compounds; but it was by no means certain that these were the ideal conditions, under which one obtained the maximum absorption of the carbon bisulphide. With regard to the working up of ferrocyanides or sulphocyanides, he would like to say that in the "Journal of the Chemical Society" for 1902, there was an extract from a patent taken out by the British Cyanides Company for the conversion of many cyanogen compounds to hydrocyanic acid, by heating them to suitable temperatures and passing over straight water gas. This seemed a very easy method; but as to its economy or otherwise, he could not say anything.

Mr. WILLOUGHBY, after acknowledging the vote of thanks, proceeded to reply to the discussion. He said he was afraid he could not answer all the questions asked. With regard to the quantity of cyanogen actually sold and that obtained in experimental work, he might say that the figures did not agree. In testing for cyanogen in the gas, they got from 5 to 6 lbs.; whereas in actual practice they were selling rather more than 4 lbs. per ton. As to oxide purification he could not furnish much information; for at Leamington the arrangement was to purify with lime and catch with oxide. With regard to carbonic acid, they had tested for this, and had found no addition. He thought it was much the same. He had no personal experience of the Foulis system referred to. Taking a question like cyanogen recovery, it would be found, on going into it, that it embraced a very large area; and in writing a paper on it, it was necessary to condense in order to make it interesting. It was a new subject practically to the Association; but he hoped that other papers in the same direction would soon follow his. Comparisons of different systems might form matter for another paper, in which the whole question could be discussed. It was, however, impossible for everything to come into one contribution. If he was to deal closely with one part of the subject, he was obliged to cut out others; but he had endeavoured just to touch upon all points. With regard to the temperature of carbonization, of course this regulated everything. The higher the heats, the better was the return. This, he thought, explained much.

SCOTTISH JUNIOR GAS ASSOCIATION.

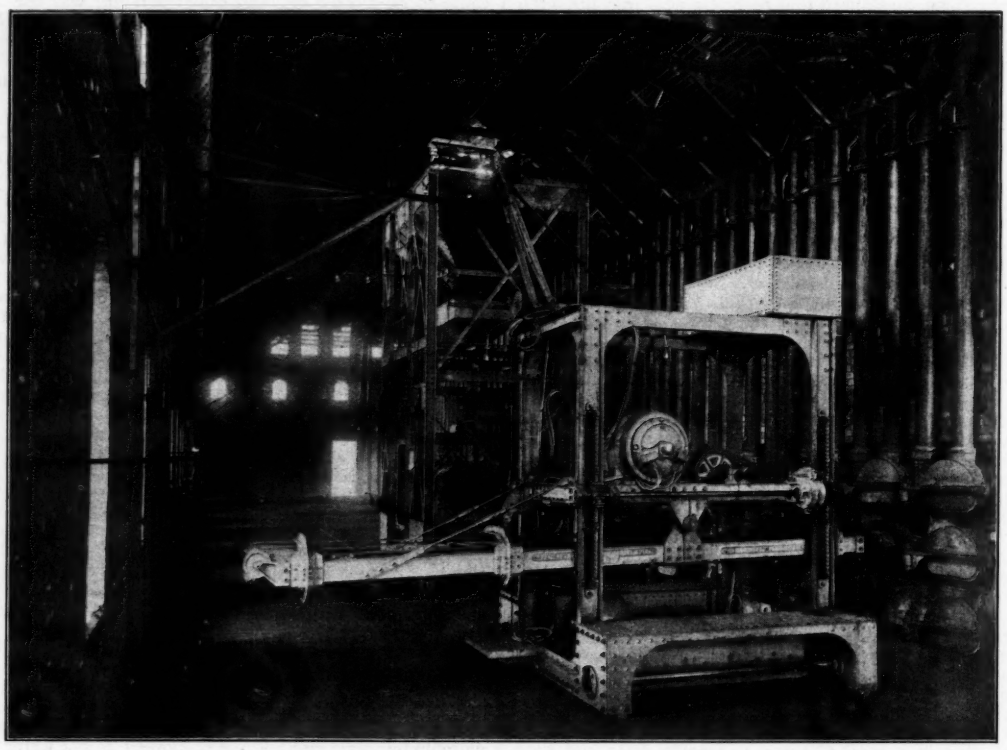
EASTERN DISTRICT.

Stoking Machinery in the New Gas-Works at Falkirk.

The Eastern District of the Scottish Junior Gas Association paid a visit last Saturday to the new gas-works of the Falkirk Corporation. Over forty members attended. They were received in the exhauster and meter house by Mr. W. M'Crae, the Engineer and Manager of the works, and by Mr. H. Rule, the Hon. Secretary and Treasurer of the Association, who is the Assistant-Manager at Falkirk. Three parties were made up, led respectively by Mr. M'Crae, Mr. Rule, and Mr. P. Blair, the draughtsman. A start was then made with the examination of the works, beginning with the coal-breaker, and going on into the coal-store and the retort-house; and afterwards following the course of the gas through the different portions of the plants to the gasholder. A description of the works was given in the "JOURNAL" at the time when the Western District visited them, which took place on the 28th of October last; and it is unnecessary to say much about the works generally. A good deal of work has been done upon them since the date of that visit.

While the works were greatly admired for their simplicity and completeness, the chief item of attraction was the stoking machinery which has been fitted up by Messrs. R. Dempster and Sons, Limited, of Elland. This was described by Mr. H. J. Toogood, of the firm, both verbally and by the aid of a diagram, which he sketched on the spot. He began his description by saying that in gas-works there was often a prejudice against electricity; but in Falkirk the coke which was produced in the gas-works was being used in the Electricity Department of the Corporation. It was there converted into current, which was used for power purposes in the gas-works. The stoking machinery and the coke-handling plant were all driven by electricity. Mr. Toogood showed how, on the top of the framework, there is a hopper containing 5 tons of coal, with underneath a small hopper in which the charge is weighed—the weight being shown upon a patent indicator—and that the coal then falls through a telescopic shoot, on to a rubber band in motion, which delivers it in an even stream into the charger. This is a circular drum, with eight blades, so arranged that, where the coal falls upon it, at the top, the blades travel at the slow speed of 4 miles an hour, giving time for the coal to be gathered, and then, as the blades come round—the speed is accelerated until, at the bottom of the drum, they are travelling at the rate of 22 miles an hour. The coal is thrown off by them at the bottom; and as soon as it starts on its journey towards the retort, the blade slows down, allowing the coal to get away through the outlet, without disturbing its motion. The charge used at Falkirk, for a 20-feet through retort, is 5½ cwt. It is placed in the retort in 30 seconds.

Several retorts were charged, to show how the work is done; and it was observed that in every instance the coal was deposited in a perfectly even layer, and there was no coal which missed the mouth of the retort. It was explained that, in the construction of the blades, in case a piece of iron or other hard substance should get among the coal and lead to a blade being twisted, the tips are separate pieces, bolted on, and if these encounter a hard substance they are simply knocked off, leaving the blade itself intact; and a new tip can be fixed in a few minutes. The machine discharges coal of any size, from 6-inch blocks to powder, mixed, at the same rate, and is thus capable of dealing with all varieties of coal. This particular machine, which is the first of its kind, has dealt with 3000 tons of coal; and as yet it has shown no sign of wear. The coal used contains 50 per cent. of dust; and the speed of the machine is from 70 revolutions at the start of the charge, coming down to 50 revolutions at the close.



THE RETORT-HOUSE MACHINERY ERECTED BY MESSRS. R. DEMPSTER AND SONS AT THE FALKIRK GAS-WORKS.

The discharging-machine was then shown at work, and was explained. The pusher, which is water-jacketed, to keep it cool when in the retort, is worked by galvanized steel-wire ropes, which also run in water, which is supplied without pressure, and therefore there is neither leakage nor priming at the glands. When the machine was first constructed, it was found that the coke was apt to jam; but a form of head with a hood has been constructed, which obviates this drawback, and the coke now comes out in an even stream. The ram moves extremely slowly until the coke starts to move; then the motion gradually increases, and the charge is hurried out. The time occupied in clearing a retort, including the return of the ram so as to be ready for another operation, is about 35 seconds.

Concurrently with the handling of the discharger, the visitors saw the working of the coke plant, which is a hot-coke conveyor, erected by West's Gas Improvement Company, of Manchester.

The inspection over, the visitors were entertained at tea in a restaurant in the town by Mr. M'Crae, who presided. He expressed the sincere pleasure he had in having the Association there that day. He hoped they had enjoyed their visit; and if any of them wished, either individually or collectively, to see the Thornhill works, they were open to them. He was sorry his Convener was out of town, and consequently was not able to be present; but he was sure he expressed the wishes and the intentions of the Gas Committee and of the Council when he gave the Association the heartiest possible welcome to Falkirk.

Mr. W. BROWN (Lasswade), the Vice-President, proposed a hearty vote of thanks to Mr. M'Crae for his kindness. He said that the members had been greatly privileged in being allowed to visit the gas-works. He was sure the town of Falkirk should feel proud that they had such a man at the head of their Gas Department as Mr. M'Crae. He had also to express their thanks to Mr. Toogood for so lucidly explaining the working of the charging and discharging machines, and said he was sure there was a future in store for them.

The CHAIRMAN, in returning thanks, said it might be regarded as a bold step to put in machinery which had not been placed in any other gas-works; but they had done it, and he was perfectly certain that in a week or ten days it would be working as well

as any other machinery on the market. Another feature of the Thornhill works, which, of course, could not be disjoined from the machinery, was the retort-bench, which had also been constructed by Messrs. Robert Dempster and Sons. The retorts were 20 feet through; and the bench had given them very good results. He wanted to bear public testimony that, in the construction of the works, he had been served most loyally and most faithfully—first of all by Mr. Rule, who had really to take charge of the old works because he (Mr. M'Crae) could not always be there; then by Mr. Whyte, who was now Chief Engineer of the Callao Gas-Works, in South America; by Mr. Blair, the draughtsman, whose father was Gas Engineer and Manager at Helensburgh; and last, but not least, by the Clerk of Works, Mr. Corner. When he stated that it was only fifteen months from the day when the first spade was put into the ground till they were supplying Falkirk with gas, he thought they had not done so badly.

Mr. A. MASTERTON (Edinburgh) heartily congratulated Mr. M'Crae on the magnificent works he had planned, and which he had supervised the erection of. They were of excellent design, and in detail and arrangement were perfect. As Falkirk and Grahamston were flourishing places, and were not likely to remain long within their present boundaries, ample provision had been made for future extensions. He was sure he expressed the feelings of all present when he wished success and prosperity to the new gas-works at Falkirk.

The CHAIRMAN, in a few sentences, returned thanks.

SOUTH-EAST OF IRELAND GAS ASSOCIATION.

A Meeting of the Association was held at Waterford last Wednesday, under the presidency of Mr. H. KIRKHAM (of New Ross), who delivered the following

INAUGURAL ADDRESS.

On receiving my copy of the "Gas World Year-Book" recently, I thought it would be interesting to compare the results obtained in Ireland during the past year with those of the previous year. I was rather disappointed to find that, on the whole, the annual make had decreased by somewhat over 8 million cubic feet. My reason for disappointment was that I found that, during the past year, consumers had increased by 10,267; while 6344 cookers had been fixed, and 300 public lamps added. Taking these figures into consideration, one would naturally expect an increased consumption, instead of the reverse. On further investigation, I found that of the 111 works, 53 had an increased consumption, 47 had remained steady, and 11 had decreased. Of the latter, two are large gas-works; and their combined decrease amounts to 62½ millions—and this notwithstanding an increase of 3487 consumers, and in one of them an additional 2046 cookers. (The number of cookers fixed is not returned by the other.) This reduction may, of course, be accounted for by the mild weather we have had, and other causes; but I think it is significant, in view of the fact that both of these works are in competition with electricity. I should like to take this opportunity of congratulating the members of the Association on their results for the past year. There are increases of 1, 2, and 3 millions, and in one case of 6 millions; but I think this latter increase is due to the fact that a large consumer is now being supplied who hitherto had his gas from a private source.

It has been stated from time to time that, when electricity is started in competition with gas, the consumption as a rule increases; and one of the reasons given for this is that a certain amount of rivalry is set up between tradespeople as to who should have the best illuminated window or shop. This may be, and probably is, true to a certain extent; but, in my opinion, a better reason is that in the majority of cases the gas companies concerned have hitherto been pursuing what I might term a somnambulistic policy; and when they are awakened to the fact that there is a formidable rival in the field, they start out to do what they should have done years before—namely, push their business. I am led to this conclusion by noting the progress made in the gas-works managed by some of the members of the Association to which I I have just referred. In the towns in which these works are situated there is no competition, and no increase of trade or population; and yet the consumption of gas is steadily increasing. Why? Simply because the works are managed as an ordinary commercial undertaking, and the business pushed and attended to in a progressive spirit. It is quite probable that, had electricity been introduced in any of these places, the increased consumption would have been pointed out as a result of competition.

As I write, I can call to mind a works I know well. Eight years ago, the output of the works was under 6 million cubic feet; while to-day it is near 15 millions. The Directors awoke from their slumbers, and adopted an intelligent, progressive, and business-like policy. They put the works in an efficient condition, and started to push the business. They are wise in their generation; for by adopting these measures they are fortifying themselves against competition. Perhaps you will think I am taking this matter of competition too seriously; but I ask, Do you hear of many electricity companies shutting down through lack of business? As a matter of fact, the progress during the past ten years has been enormous. In that time the electricity works owned by companies and municipal authorities have increased by 374; the number of glow-lamps fixed, from 2 to 20 millions; the number of units sold, from 18 to 448 millions; while the average working cost has been reduced from 4d. to 2·3d.

There is a good deal said as to the higher cost of lighting by electricity as compared with incandescent gas, which no doubt is true at present; but is not this the only real obstacle to its more general adoption? If an electric company were in a position to offer an equal amount of light at the same cost as that charged for gas, which illuminant do you think the majority of people would choose? The invention of the mantle has wrought a revolution in gas lighting; and the man who would have ventured to prophesy such a result (say) twenty years ago, would have been laughed to scorn. And probably a man's sanity would have been doubted who (say) ten years ago would have stated that it would be possible to communicate with vessels moving at 20 miles per hour, hundreds of miles out at sea. Looking at things in this light, would he not be a rash man who would suggest that the electric accumulator has reached finality, or that the efficiency of the electric lamps as used at present are beyond improvement? I have already shown that the cost of generation has been reduced by nearly one-half in the short space of ten years. Would anyone say it cannot be reduced further?

I am strongly of opinion that, before many years are past, gas companies will be supplying both gas and electricity—there are some already using electricity for motive power. I am not aware of any gas company supplying electricity yet; but there are a number of local authorities owning gas-works who are doing so. In Ireland, we have a notable example in Belfast; and, as if further to point my moral, there appears in this week's "Gas World" a short description of the electric plant as fixed in the gas-works of the Honley District Council, both of which are under the control of the Gas Manager. It is stated that they are working successfully. Would it not be well, therefore, if the members of the Association spent some of their leisure hours in studying electricity? It would be no load to carry; and a good working knowledge of the subject may be of considerable use to them a few years hence. Besides this, it is a most interesting matter for study.

I now turn to another danger that besets the gas manager. From time to time vacancies are advertised, and comments are made as to the inadequate salaries offered. Sometimes it is amusing to read the qualifications required in the smaller works. I have often thought that if the poet who wrote "Man wants but little here below" could read these advertisements, he would change his song considerably—at least, as far as the authors of the advertisements are concerned; and the strange part of the affair is that, no matter how low or how miserable the salary is, you will find candidates turning up in the words of the comic song, "In squadrons and platoons." A short time since, there were over 150 applications for one vacancy in England—more than enough to supply the whole of Ireland with managers, and still have a couple of score over. Is it any wonder that salaries are cut down, when the supply exceeds the demand to such an extent? I think there is work here for the various Associations to combine and grapple with, and initiate some scheme whereby this state of things may to an extent be remedied.

Some attention is now being given to automatic street lighting; but up to the present I have seen no report of any lengthened tests, nor any opinions as to the reliability of the apparatus employed. There appear to be two methods on trial—viz., one in which the gas is lighted and extinguished by clockwork; and the other in which the apparatus is worked by a temporary increase of pressure at the works or other suitable place. I have experimented in a small way with the latter method, by means of a controller devised by myself. It is very simple in construction, and works well; but I think the increase of pressure required to work this method will militate against its general adoption. Though the pressure required to work each controller individually may be small, still to get the increase at the controller farthest away entails an increased pressure considerably in excess of that required to work each individual appliance, as a large amount would be absorbed before reaching the apparatus. The consumers near the works or point from which the pressure is increased would therefore be treated each evening to probably double the normal pressure for about half-a-minute, and the same at the time the lamps are extinguished.

To my mind, this would be very objectionable to many. The system, however, has the advantage that the lamps could be lighted or extinguished at any hour; and it should prove cheaper in first cost than the clockwork arrangement. These are a few thoughts formed during my experiments, and may be at variance with results on a working basis. Probably before long we shall have reliable information from parties who have had both systems on trial for a lengthened period under working conditions.

At the present time, our business in tar is at a very low ebb. We are compelled to sell it at a price much under its real value. I feel certain there are many uses at present unknown to which it could be applied; and surely there is room here for research by some of our eminent chemists. In New Ross, as you are aware, tar is used largely in the manufacture of roofing felt. I saw it employed last year in a way perhaps known to some of you; but a description thereof may be of interest just now.

A new post office was built in New Ross; and the floor was formed by filling in, and well ramming, and levelling the ground On this, 3 or 4 inches of cement concrete was laid, and levelled. When this had set, a mixture of breeze or small coke (from ¾ to

1½ inches cube) and hot tar and asphalte was put down, well rolled, and brought level. On this the flooring boards were laid. These boards were 1½ inches, tongued and grooved. A liberal supply of hot tar was brushed on to the mixture, as each board was laid. The boards were thus practically embedded, and were secured by means of nails driven into the breeze and tar mixture. I was somewhat sceptical as to the nails having sufficient grip to keep the boards securely in position; but up to the present time there is not the slightest appearance of any of them giving. It has undoubtedly made a splendidly solid floor. The contractor is most enthusiastic over this method of making floors on ground levels; and he is of opinion that it only requires to be known to be appreciated. I suggested that it might prove too expensive for general adoption; but he pointed out that by this method the cost of dwarf walls to support floor joists, and the joists themselves, is saved; and there is no need to provide for ventilation under the floor. So that, taking everything into consideration, the cost comes out very little (if any) more. He also pointed out that the wood could not be affected by dry rot, as the tar acts as a preservative; and as there is no vacant space under the floor, it is impossible to be troubled by rats or other undesirables. The tar also tends to keep the place healthy, as it acts as a disinfectant. The amount of tar used in this way annually would, of course, make but little impression on sales; but every little helps.

Of late there appears to have been a greater interest taken than hitherto in the use of tar for the surface of roads and footpaths; and this interest will undoubtedly lead to further experiments. In all likelihood, in a few years we shall find it more largely used for this purpose. In some of the Waterford footpaths, we have splendid examples of what can be done in this direction. Perhaps our worthy Secretary may be able to induce his Borough Surveyor to give tar macadam a trial on a portion of one of the roads the next time the steam-roller is at work. As the Waterford Corporation officials are able to make such capital footpaths, the experiment should have every element of success.

The address was open for discussion; and most of the remarks made upon it ranged round the cause of the reduction in the gas sold in Ireland during the past year. It was generally agreed that the main reason was the more general adoption of the incandescent light, and, in a lesser degree, to the mild weather and suction producer competition in conjunction with electric light. Some of the members gave instances where huge reductions had been attained in individual accounts by incandescent burners. It was thought that, whatever competition had been faced in the past, greater efforts would be necessary in the future if gas was to maintain its position. The "Tantalum" electric lamp was instanced as a big advance, owing to its giving more light at about one-half the usual consumption of electric current. The falling off in the value of tar received some consideration; and its use for macadamized roads was strongly advocated.

Mr. J. F. Tyndall (Mallow) read the following paper:—

THE FITTINGS BUSINESS IN RELATION TO THE SALES OF GAS.

The subject of my paper is so intimately bound up with the competition we wage against rival illuminants, heating, cooking, and power agents, that I do not make any apology for breaking from the more fascinating subject of gas manufacture, as distinct from gas sales. I grant that profits are made in the retort-house; but, having made a saleable commodity, what means are you taking to satisfactorily dispose of it? Are you fastened up in your works all day, simply waiting for something to "turn up," or are you turning something up? Small managers, with an unlimited number of duties, do you find it necessary to be up to your neck in tar all day, or otherwise unfit to meet a customer? Are any of you so well up in your business that you cannot spare an odd quarter of an hour with a traveller? Are you as busy as the individual who, writing to a gas publication some time ago, would have us believe that he had not time to eat his meals? Or even assuming you do not require 100-ton cranes, &c., is there any harm in your reading a pamphlet, and making yourself acquainted with one? Are you discreetly advertising your goods in a systematic manner which does not allow your customers to forget the fact that a gas company is very much alive in their midst? Have you that best of all advertisements—a show-room; and do you see that it is one in a true sense? Or, if too small for that, have you considered whether it would be worth your while to give some prominent shopkeeper special terms, reserving to yourself the right to show goods occasionally, and good lighting constantly? This is not theory. I am addressing small gas managers, and practise what I preach.

The proof is found in the rapid development of the Mallow Gas Company, where, from a 2 million works at the beginning of 1902, we have closed the year 1905 a 5¼ million works, having last year alone added 82 new consumers, 78 cooking-stoves, 700 yards of new mains, and 350 yards of services, by our own fitters. It may surprise you to know that I have no difficulty at all in keeping a fitter and an apprentice constantly engaged in the fitting business; and by that term I place a broad interpretation on all apparatus through which our gas is used. Strictly speaking, as gas suppliers, our duties cease when the gas passes the measuring instrument; and we have no right to dictate how it should be used, any more than an oil merchant should trouble whether you waste the oil in lighting fires or use it in the most economical lamp. But I have seen such muddles made of internal gas-fitting work, resulting in wasteful and ineffective use of gas, and have noticed that the efforts of outsiders to push the best means of using gas are so slow, that I have long since concluded that gas suppliers should retain control of their commodity to the point of using. To this end, I think it must be an extremely small undertaking that cannot find plenty of work for a fitter. A system of thorough maintenance of incandescent burners, cookers, and fires would alone warrant one. The frequency of poisoning cases from escapes of gas rather tends to our prejudice; but I think a great deal of confidence is given to consumers from the knowledge that a qualified fitter is kept for prompt attention.

My Company advertise locally by leaflet at seasonable times; and twelve months' advertisements have covered every phase of gas apparatus, and notified the fact that we undertake the most up-to-date and complete installations of incandescent or automatic lighting, cooking, heating (including bath-heating), or gas-engines. Our lighting, I am pleased to say, includes 78 per cent. of incandescent burners of all styles, except those using high-pressure compressed gas.

Speaking generally, I should say the fittings business is well worth developing in any go-ahead works, and a qualified fitter is a good investment. Many, no doubt, will disagree with this statement, and consider that the manager should do all that is required in this way, and make himself a general handy man. With due respect to my opponents' opinions, I maintain that it is not to the true interests of any small gas company to expect the manager to be simply a handy man. A gas manager is only a human being, and he cannot attend successfully to all phases of gas manufacture and distribution without liberal help. Either the carbonizing results are good and the business is undeveloped, or the business development is good and the carbonizing results bad. Something has to suffer; and I think a small manager is better employed in directing, in a general manner, the manufacturing and distributing processes—putting in what manual labour he can, by all means, but not neglecting to exercise his brain, or get among his customers, for the successful development of a gas undertaking depends upon the manager's own personality rather than upon some particular policy pursued.

The proof of the pudding is in the eating; and I have some little reason to back the policy outlined above, by my balance-sheets; the average annual profits on fittings business being about £40. It is to this question of profit that I most particularly wish to draw your attention; my strong opinion being that the fittings business should be an *aid* to the sales of gas, and should not be made a prime line for profit-making. We have already agreed that profits are made in the retort-house. Endeavour, then, by all means to retain them in the district distribution, and find an outlet for your commodity by placing with the consumers the means for using it as cheaply as possible. My experience shows that 3 per cent. on the cost of fittings covers carriage and possible breakages. Allowing for booking and stocking, I think 10 per cent. on the cost should be a limit charge on fittings.

I believe that, located as we are in small country towns far from the coalfields, and with other causes operating to keep gas necessarily high-priced, we shall have to place apparatus free to the point of using, and get back the cost in the price of gas. Large companies and those selling at 2s. to 3s. per 1000 cubic feet will not appreciate the point of this; but those who charge 5s. or upwards know perfectly well how hard it is to secure business, and are quite conscious that they have anything but a cheap illuminant. The time may be some distance off; and at present I am content to appeal for a more consistent and businesslike method of dealing with the supply of fittings in relation to the sales of gas, and for the letting on hire of lighting, cooking, heating, or power apparatus at a nominal figure to cover cost.

I will conclude with two quotations. The Chairman of the Melbourne Gas Company, in the course of his remarks, referred to opinions expressed at the two previous meetings that the rent charged for stoves should cover the cost of repairing them (implying that if it did not do so the Company should give up hiring out stoves, and should only sell them); and he said: "At first sight this seemed to be a very businesslike suggestion; but it lost sight of the main issue. The Company's business was to sell gas; and all else was merely an adjunct for the purpose of increasing the yearly output. . . . This was the important point; for as consumption increased standing charges were reduced." At the meeting of the Irish Association at Waterford in 1903, the President (Mr. J. G. Tooms), in the course of his address, said: "I consider that all gas appliances should be fixed free, on hire or hire-purchase, with as few restrictions as possible."

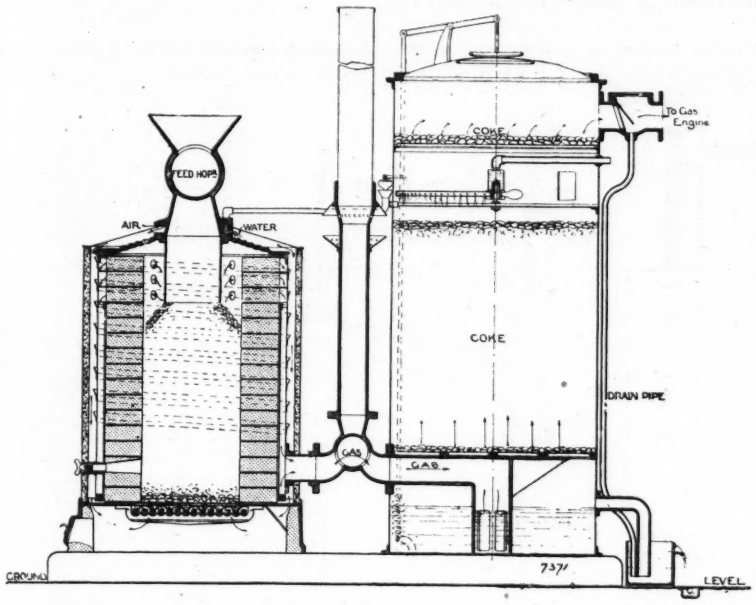
The paper was well received, and evoked a spirited discussion.

It was decided that the next quarterly meeting should be held in Mallow.

The announcement was made that "the prize of one guinea's worth of books, to be awarded each year by the Association to the gas student, not necessarily a member of the Association, but employed at a gas-works which has a representative in the Association, who, in the opinion of the Committee, had most distinguished himself in Technical Examinations," had been awarded to Mr. J. F. Tyndall, who, besides obtaining a first-class certificate in the Honours Grade in "Gas Manufacture" at the City and Guilds of London examination, had taken two certificates in "Chemistry."

THE "WATT" SUCTION GAS-PRODUCER.

The prominent position taken during the past few years by the various appliances introduced for the production of gas on the suction principle invests this plant with special interest for the makers and suppliers of ordinary coal gas, especially in connection with its use for the production of motive power. One of the recommendations of these producers is their simplicity; and it has so far been fully justified. At the same time it has been recognized that, unless all the parts of the apparatus are delicately balanced and easy to manipulate, the tendency to produce bad gas, and therefore to cause waste, is considerably increased. It seems, from an article in the current number of the "Engineering Magazine," that a new type of apparatus, involving features in design and construction which would appear to be novel, and further to indicate that attention has been



devoted to the features mentioned, has just been introduced by Messrs. James Watt and Co., of the Soho Foundry, Birmingham, the details of which are shown in the accompanying illustration, the block for which has been kindly placed at our disposal by the Editor of that publication.

It will be observed that the fire-bars are easily withdrawable, and can be individually rotated without admitting air under the grate. The case of the generator is double; and the hot gas, as generated, passes down an inner annular space. The air and steam descend an outer annular cavity, which is externally coated with heat-retaining material, and lagged with sheet steel and brass bands. The steel case, which serves as a wall between the inner and outer annular spaces, is provided with a spiral trough on its outer service, serving to conduct and distribute the water, which is fed on to the top of the generator, uniformly over the surface of the intermediate case, which is itself heated up by the outgoing gases. The inner cover of the generator is made in the form of a volute trough, which receives the water supply near its centre; the water flowing in a circular path, and finding its way into the trough on the vertical side of the intermediate case referred to. The air drawn in through the cover and the vapour generated mix together are heated up, and then pass under the grate. No external vaporizer needs to be employed, and the use of a boiler with many fittings, pipes, and connections is dispensed with.

The gas is, of course, made by passing the mixture of steam and air up through the incandescent material, whereby decomposition results, and gas is the product. With too much steam, a rich gas is momentarily made; but the fuel cools down quickly and ceases to act. With too little steam, the fuel clinkers from excessive heat, and poor gas is made; the energy being liberated in the generator instead of in the cylinder of the gas-engine. It will be noted that the connections are simple in character; there being but one two-way gas-valve, which directs the products from the generator either into the washer or up the waste-pipe. It is impossible to operate this valve wrongly, and so cause an accident. With a multiplicity of valves, there is the danger of their being operated in improper sequence, and so admitting air to the washer—making an explosive mixture.

The method adopted of heating up the plant forms one of the distinctive features of the apparatus. The fire is laid in the generator and ignited, and a little greasy waste or other inflammable material is then placed on the small circular grate on the waste-pipe above the two-way valve already mentioned. On applying a light to this material, an intense draught is caused up the waste-pipe, and very quickly combustible gases arise from the fire in the generator, and themselves ignite inside the waste-pipe at the point where the perforations are placed. The draught is thus maintained, and the generator is quickly brought to gas-making condition.

When the gas is passed into the washer for the first time, the air is displaced by moving the flexible diaphragm up and down. This acts as a pump; the dip-pipe serving as an inlet-valve, and the flap-valve at the outlet from the washer as a delivery valve. The gas is thoroughly washed in passing up through the column of coke, which is sprinkled by an automatic device rotated by the action of the water-jets issuing from a perforated arm. In this way the whole surface of the material is uniformly wetted. The gas on rising from the wetted coke passes through a layer of dry coke, which intercepts any spray or splashes of water.

The flexible diaphragm serves a triple purpose. It acts as a pump, initially, as explained; it gives a steady supply of gas to the engine, and causes air and vapour to pass uniformly through the hot fuel in the generator; finally, it controls the water supply—each deflation of the diaphragm by a suction stroke of the engine producing a movement which is transmitted to the water-valve, a specific quantity of water being thus liberated each time the engine takes a charge of gas.

A "TRAP" FOR NAPHTHALENE.

In the "JOURNAL" for the 23rd ult., a short description was given of an appliance, called a "Naphthalene Trap," patented by the Paris Gas Company, for removing this troublesome deposit from gas. The specification is contained in the current number of the "Journal de l'Éclairage au Gaz et à l'Électricité."

The "trap" is in principle only a portion of the distributing plant designedly placed in the most favourable conditions for being obstructed by naphthalene, and at the same time so arranged that the deposit can be easily removed by opening and shutting a few taps. The trap consists of a case, in which the gas comes into contact with one or with several baffles or open-work diaphragms, formed of a kind of grating, the bars of which are thin tubes through which pure water, a solution of water and glycerine, or cold air constantly flows. A thin sheet of cast iron or zinc, perforated with numerous openings (clefts with their edges separated), is fixed to the grating, and, being cooled by conduction, presents to the gas a large cold surface, on to which the naphthalene is precipitated. When the accumulated deposit begins to obstruct the orifices of the grating and check the current of gas, the trap is shut, and the gas flows through a bye-pass. The cold fluid running through the pipes is then replaced by steam at 100° C.; and the adhering naphthalene is liquefied, and runs away through a syphon. When the melted naphthalene has been taken from the trap, the latter is allowed to cool, and then

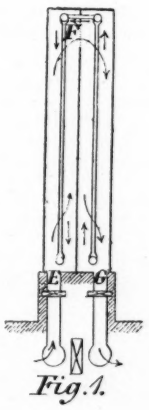


Fig. 1.

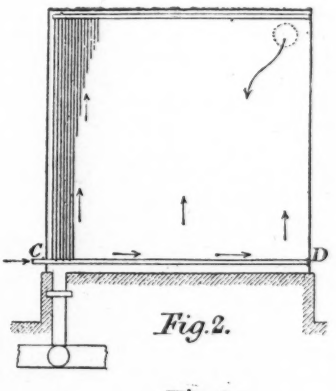
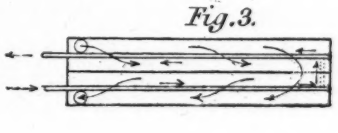


Fig. 2.

Fig. 3.



the current of cold water or air is again put into circulation, and the apparatus once more set to work. A refrigerator of the ordinary type produces the requisite amount of cold fluid, which is made to flow permanently between the trap and the refrigerator by means of a pump.

The accompanying illustrations show the general arrangement of the appliance constructed on a working scale. It is a rectangular sheet-iron box measuring about 13 ft. by 13 ft. by 3 ft. 3 in., placed vertically on edge, and divided by a solid sheet-iron plate into two compartments, as shown in figs. 1 and 3. Two refrigerating diaphragms, which are essential parts of the apparatus, occupy the centre of each compartment. These diaphragms are formed by a horizontal pipe at the top, connected by numerous small vertical tubes to the pipe C D (fig. 2), which is like the other, and placed at the bottom of the box. The small tubes, of thin copper, which constitute the bars of the refrigerating diaphragm, are placed in two rows, as shown. They are fixed 2 inches apart, while the space between the diaphragms is about 4 inches. The two parallel gratings connecting the upper and lower pipes are covered by sheets of perforated copper or sheet iron fixed to the bars. The large arrows indicate the course of the gas. Entering at E (fig. 1), it crosses the first box diagonally, passing through the first diaphragm. At F it enters the second box, passes through the second diaphragm, and makes its exit at G. The cold fluid, water, or air moves in the opposite direction inside the two diaphragms, as shown by the small arrows. It first passes through the tubes of the second box from bottom to top, and afterwards through those of the first box downwards. Then it returns to the refrigerator, from which it is pumped back to the trap by continuous circulation.

HARTMAN'S GAS-GENERATOR.

Accompanied by the illustration reproduced below, the last number to hand of the "American Gaslight Journal" gives, in the words of the patent specification, a description of a gas-generator for which a United States patent (No. 808,365) was granted, on the 26th ult., to Mr. Henry A. Hartman, of Philadelphia, Pa.

The retort is so constructed that fuel may be readily directed through the main body by its own gravity "without necessarily requiring means to occasion said passage;" while means are also provided for preventing the clogging of the fuel and coke in the retort, "while the latter presents a large surface to the action of the heat of the furnace."

Fig. 1 is a partial elevation and partial vertical section of the generator; fig. 2, an end elevation; fig. 3, a vertical section of the hydraulic main.

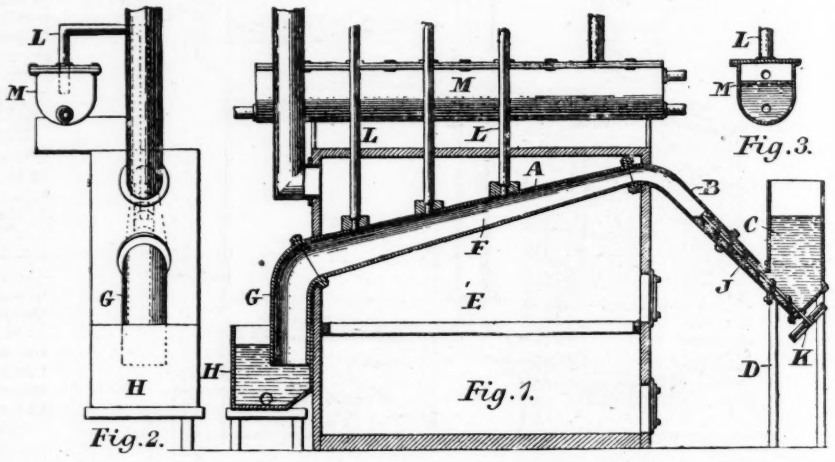


Fig. 1.

Fig. 2.

Fig. 3.

The retort A is elbow-shaped and has one limb B, opening into the water column C. This column, mounted on the supports D, constitutes a hopper. E is the furnace over which the main body F of the retort is supported, so as to be subjected to the heat of the furnace. On the end of the limb F opposite to the limb B is a downwardly-deflected limb G, which opens into a tank H, adapted to receive water or other fluid. It will be noticed that the retort is of conical form, so as to increase in diameter in the direction from its inlet at the column C to its discharge at the tank H. Within the limb B is a spiral conveyor J, which is partly continued into the column C; the shaft of the conveyor having connected with it a pulley K, to which power may be communicated to rotate the conveyor. Rising from the retort are pipes L, in communication with the hydraulic main M.

Coal is introduced into the column C, and as the conveyor J rotates, the coal, in a wet condition, is raised into the limb B and forced into the main limb F, where, subjected to the heat of the furnace, coal gas results. At the same time, as more coal reaches the upper portion of the limb F, the water from it travels down the limb and is converted into steam, which must pass through the hot coal in order to reach the take-off pipes L—thus adding a percentage of gas to the larger quantity of coal gas made. The resulting coke is directed from the limb F into the limb G, from which it will be dropped into the tank H, and quenched by the water therein, after which it is discharged from the tank in any suitable manner.

It will be noticed, says the patentee, that "owing to the conical or widening shape of the retort, the coal successively entering the limbs B and F will be prevented from clogging therein, and so will discharge therefrom in a reliable manner; the coke formed in the limb F also being prevented from clogging therein as well as in the limb G."

PRODUCING GAS IN VERTICAL GENERATORS.

A patent has been taken out by the Compagnie pour la Fabrication des Compteurs et Matérial d'Usines à Gaz, of Paris, for a process of carbonizing coal in vertical generators for the production of illuminating gas and coke. The specification was given in a recent number of "Le Gaz," from which the following particulars have been obtained.

The process may be carried out in a single generator or in several grouped together, as shown by the accompanying illustrations; but, for the purpose of description, we will take the arrangement in fig. 1 (p. 361). It will be seen that it consists of two generators A B, which are connected at the bottom by a pipe C. Supposing A to be filled with incandescent coke and B with coal to be carbonized, a stream of coal gas is turned into A by means of the pipe D, passes through the mass of coke, becomes heated by contact with it, and makes its way by the pipe C into the second generator, where it effects the distillation of the coal contained therein, and escapes by the pipe E mixed with the gases resulting from that operation. The temperature of these gases is taken at the outlet of the second generator; and when it is found to be too low, working is stopped by closing the pipes D and E, and the coke in A is revived by a current of air sent into it through the pipe F. The combustion gases resulting from this reheating of the generator are carried by the pipe G into a flue H.

When the temperature of the coke has been sufficiently raised, the pipes F and G are closed, and the previous working conditions are restored by opening D and E. When the coal in the second generator has been fully carbonized, the coke in the first is removed at the outlet I, at the bottom, and filled with coal from above at J. The operation is then reversed; the coke in the second generator being utilized to furnish the heat necessary for the carbonization of the coal in the first. Under these conditions, the stream of gas is admitted to B by the pipe E, passes through C into A, and makes its exit by D. The coke in B is revived by a blast of air sent into it through the pipe K; and the products of combustion are conveyed into the flue H by the pipe L. Before going into the incandescent coke, the gas may be heated by passing through a recuperator maintained at a high temperature by the volatile products of distillation. Similarly, the air necessary for "blowing up" the coke may be heated in a chamber in which the combustion gases circulate. Further, the coke, prior to its removal from the generator, may be cooled by a stream of gas which is afterwards sent into a generator containing fresh coal, for starting the distillation process. Worked under these conditions, it is claimed that the process results in the production of a considerably increased yield of gas.

Turning to the combination shown in fig. 2, it will be seen that distillation is effected in generators arranged in series; the stream of gas being heated by glowing coke in a special receptacle. According to this combination, instead of the combustion of the coke being effected in the generator in which the distillation has been carried on, as in the arrangement shown in fig. 1, a certain number of generators are grouped in series round a central one in which the "blowing up" will take place, and which may be put into communication with all the others in succession. In fig. 2, M is the central generator, and it is traversed from bottom to top by the stream of gas, which passes in rotation the generators

N O P in the same way—Q being isolated so as to allow of the removal of the coke and the insertion of a fresh charge of coal.

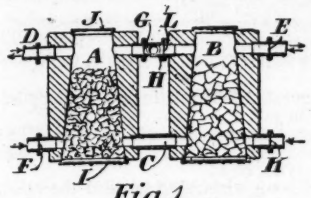


Fig. 1.

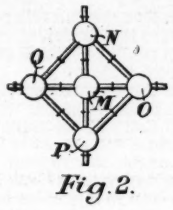
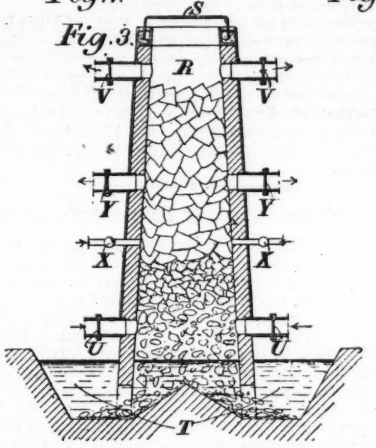


Fig. 2.

Fig. 3.



It now remains to consider the arrangement shown in fig. 3, in which continuous distillation is effected in one generator. The coal is charged from the top into the receptacle R, and the coke withdrawn cold from the bottom—the necessary openings being secured by hydraulic joints S T. The stream of gas, admitted by the pipes U, becomes heated in the process of cooling the lower layers of coke, effects the distillation of the coal at the top, is cooled, and passes out with the products of distillation by the pipes V. In this way, the complete recuperation of the heat of the incandescent coke and of the volatile products of combustion is effected. The zone in which distillation takes place is maintained at the desired temperature by periodic "blows," by means of the pipes X; and the furnace gases are conveyed away by the pipes Y. Under these conditions, assuming that perfect recuperation has been realized, the loss of heat is reduced to a minimum.

The patentees' claim covers a process for distilling coal in a generator with the object of producing illuminating gas and coke, consisting essentially in effecting the distillation of the coal by sending through it a stream of coal gas raised to a suitable temperature by passing it through glowing coke, and the method of carrying out the process already described.

The Charge for Electricity in Calcutta.

It appears from "Capital"—a Calcutta paper—that much dissatisfaction exists in the city at the charges of the Electric Supply Corporation, which are 8 annas per unit for lighting and 4 annas for power. The cause of the feeling alluded to is the fact that the East Indian Railway Company are supplying themselves, through their own installations, with current for both light and power at 1 anna per unit; and it is thought that an all-round price of 4 annas, subject to revision and subsequent reduction, might be tried for a year. It is put very forcibly, in the publication named, that if current can be generated for power and light by private installations at 1 anna per unit, "it is absolute folly to allow an English Company to drain away exorbitant profits from Calcutta by charging 4 and 8 annas for the same thing." The writer points out that if the Company prove obstreperous in giving way, the representatives of the community ought to know what to do. They can generate electricity themselves, or license another company to compete with the existing one, who seem to think they have obtained a virtual monopoly to "spoil the British Indians." He concludes by giving this advice to the consumers: "Watch your meters; read them, note them, and see that they are telling the truth." He might well have added: "If still dissatisfied, try what gas can do."

Sutton, Southcoates, and Drypool Gas Bill.—The Streets and Lighting Sub-Committee of the Hull Corporation Works Committee have passed a resolution expressing the opinion that a clause should be inserted in the Sutton, Southcoates, and Drypool Gas Company's Bill giving the Corporation compulsory power to purchase the undertaking, and providing for the position and depth of gas-mains to be laid in private streets. The Sub-Committee recommended that the Parliamentary Committee should be asked to take the necessary steps to obtain the insertion of such clauses.

Vibration from the Manchester Electricity Works.—A case was last week mentioned in the Chancery Court of Lancashire, in which the Corporation of Manchester were the defendants; while the plaintiff was Mr. J. Emmott Barlow, M.P., the owner of some premises in Dickinson Street. Mr. Barlow sought an injunction and damages in respect of vibration caused by the Corporation electricity works; but it was stated that the parties had come to an agreement, the terms of which were not made public. Mr. Grant, who appeared for the plaintiff, remarked that the Corporation were "taking it lying down."

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by Correspondents.*]

The Rating of Machinery.

SIR,—With reference to the paragraph on the above subject in your issue of the 16th of January, Mr. Goodwin is evidently not aware that the Exemption Act of 1840 was brought strongly before the House of Lords in *Kirby v. The Overseers of Hunslet Union* by Mr. Balfour Browne; and Lord Halsbury said: "That Act seems to me to have made a distinction between inhabitants and occupiers, and nothing else; but if you come to talk only of the difference made by that statute, at present I do not follow any difference made except inhabitant and occupier."

Sunderland, Jan. 29, 1906. THOS. F. HEDLEY AND SONS.

The Future of the Gas Profession.

SIR,—As a striking example of "every man for himself," as quoted by "One of the Present," in this week's "JOURNAL" an advertisement appears from the Godalming Gas Company seeking applications for a working foreman, whose duties are to manage their works (with an annual make of 40 millions), and to perform all the duties of their late Manager, for the princely sum of 42s. per week, with house, &c. They have, it is said, been advised to this "extravagance" by their Consulting Gas Engineer—a leader in the profession—who, I have no doubt, on occasion, talks tall platitudes about "helping the humbler members in one cordial spirit of loyalty and mutual helpfulness."

This is not an isolated case; but, as the letter of "One of the Present" and this advertisement appeared in the very same issue of the "JOURNAL," I was constrained to write and point out how futile it is to propound schemes. When those in high places, and who sit on Boards of Directors because of their technical knowledge, act as stated above, we have great cause to fear for the future of the gas profession.

Feb. 1, 1906. TRUTH.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

(*Before Lords Justices* VAUGHAN WILLIAMS, STIRLING, *and* FLETCHER MOULTON.)

Tuesday, Jan. 30.

Eveson Coal and Coke Company, Limited, v. Grassmoor Colliery Company.

This was an appeal by the plaintiffs from the verdict and judgment given at the trial which took place before Mr. Justice Darling and a Special Jury at Birmingham last summer.* The plaintiffs brought their action to obtain damages from the defendants, who are colliery owners at Chesterfield, for, as was alleged, knowingly persuading and inducing one, Thomas Cash, to break his contract with plaintiffs. By an agreement dated Sept. 1, 1897, Cash was appointed as traveller to the plaintiffs; it being a term of the agreement that he would not, without the consent in writing of his employers, engage in any business or occupation except that of the plaintiffs, and that he would not divulge any information which he should receive in connection with their business. At the trial, it was urged that the defendants had on various occasions knowingly and unlawfully persuaded Cash, in breach of his agreement, to solicit and obtain on their behalf orders and contracts from different gas companies who had been customers of the plaintiffs; and upon these orders he had received a commission from the defendants. Plaintiffs alleged that, in consequence of these wrongful acts, they had been seriously injured. The defence was a general denial of the various allegations; and the Judge having left certain questions to the Jury, they found that defendants were not aware of the agreement between Cash and the plaintiffs that he should devote the whole of his time to their business; that they had not persuaded or induced Cash to purchase coal of them for resale to customers of the plaintiffs, in breach of his agreement; and, further, that they had not conspired with Cash to do any of the acts complained of. Upon these findings, the Judge entered judgment for the defendants.

Mr. HUGO YOUNG, K.C., and Mr. LESLIE appeared for the plaintiffs; Mr. MONTAGUE SHEARMAN, K.C., and Mr. W. B. HEXTALL represented the defendants.

Mr. YOUNG, having stated the facts of the case, contended that Mr. Justice Darling had misdirected the Jury in several important respects; the case of the plaintiffs not being put before them in such a way as to guide them in coming to a right conclusion. He referred at some length to the correspondence which had passed between the parties, and also to the way in which the defendants' books had been kept, as well as to the evidence given at the trial, as showing that Mr. Leach (defendants' Manager) was perfectly well aware of the agreement which Cash had entered into with the plaintiffs, and that in doing what he had done he had made the defendants liable.

Mr. SHEARMAN thought his learned friend had rather underrated his own ability in putting the issue before the Jury, which was: Aye or no, did Leach know of the breach of duty on the part of Cash. He had also underrated the intelligence of the Jury, which would enable them to deal with a matter that had occupied their attention for the whole of two days. He submitted that the Judge had properly directed the Jury. It was for the plaintiffs to make out the case that they set up,

* See "JOURNAL," Vol. XCI., p. 387.

of "knowingly inducing or procuring" and conspiracy. A condition precedent to success was to show that Leach knew that what Cash was doing was a breach of his contract with the Eveson Company; and the Jury, after hearing the whole case, came to the conclusion that Leach was telling the truth when he said he did not know that Cash was under an agreement to represent only the plaintiffs. It was a very common thing on the Coal Exchange for one person to represent more than one employer.

Friday, Feb. 2.

Mr. SHEARMAN this morning resumed his argument on behalf of the respondents, and went at some length into the evidence and the summing up; contending that there was absolutely no proof of inducement offered by the defendants to Mr. Cash, to break his contract with the plaintiffs, or that they had any knowledge that he was under an exclusive contract with them. He admitted that there was some evidence on which the Jury might have been asked to find that there was a conspiracy between the defendants and Cash. But, in the first place, it was unknown to bring an action for conspiracy against one only of two named parties; and Cash, the other party to the alleged conspiracy, was not made a defendant. Further than this, the whole of the evidence, such as it was, only pointed to a case of suspicion; and it was eminently a question for a Jury to decide. He submitted that the proper questions were left to the Jury, and properly left, and that there was no ground for granting a new trial, or for saying that there had been any miscarriage of justice.

Mr. HEXTALL followed on the same side.

Mr. HUGO YOUNG was not called upon to reply.

Lord Justice VAUGHAN WILLIAMS, in giving judgment, said, in his opinion, there ought to be a new trial in this case. The appeal was not based on the ground that the verdict was against the weight of evidence, or on the suggestion that there was no evidence to support the verdict of the Jury. It was really based on misdirection; the suggestion being that the Judge, in his summing up, did not leave to the Jury the question they had to decide, coupled with such directions as would enable them to decide it properly. The Jury might or might not have understood what the true question was; but that Court had not to decide whether they did or did not. It had been suggested that because they were a Special Jury of Birmingham they must have done what was right. He did not know how that might be. He could not say whether they did or did not understand the true question which had to be decided. But, in his opinion, the summing-up of the learned Judge was calculated to mislead them on the question; and, that being so, there ought to be a new trial. The learned Judge then stated the nature of the action, and read passages from the summing-up of Mr. Justice Darling, in the course of which he quoted from the statement of claim, and said, with reference to one of the passages, that, under the circumstances, especially having regard to the time when the observations were made, it was a very unfortunate observation to make to the Jury. In his view, they would be apt to think they could not find for the plaintiffs unless Mr. Leach's personal knowledge of the contents of the written agreement between the plaintiffs and Cash were proved. He spoke of the contract being in writing; and of the question as to whether Mr. Leach saw it, and of Mr. Leach's oath that he never saw it; and he (his Lordship) could not help thinking that these observations might, in the minds of the Jury, give an importance to a knowledge of the actual terms of the contract which was quite incompatible with the broad issue which Counsel on both sides accepted as being the right one in the case. This having been the commencement of the summing up, they found further on a very long discussion as to persuading, procuring, inducing, and so on, again with reference to the written agreement. He dealt very narrowly with the question of conspiracy, and then put the questions. Having read the first question, his Lordship said that, in his judgment, it was very unfortunate the learned Judge had put it in the form he had done. Both Mr. Shearman and Mr. Hextall had to concede that the words "in writing" in that question were very unfortunate. The whole of the summing-up, from first to last—including the questions put to the Jury—was such as to lead them to suppose that the question they had to decide was not the broader issue which he mentioned, but the narrower question—whether or not Leach knew that Cash had agreed with the plaintiff Company that he would not, without their consent in writing, employ himself in or about any business or occupation except that of the plaintiffs, and would devote his whole time and attention to it. In other words, they might well have thought that it was essential to the plaintiff's cause of action that Leach should have known of that document. Under these circumstances, there ought to be a new trial; and the costs of the former trial and of the appeal would abide the event.

Lords Justices STIRLING and FLETCHER MOULTON gave judgment to the same effect.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

(*Before Mr. Justice* SWINFEN EADY.)

Friday, Feb. 2.

Tottenham and Broadway v. Portsea Island Gas Company.

This was a motion on behalf of the plaintiffs in the action which was brought to restrain the defendants from fouling a stream of water which ran through the plaintiffs' land, by allowing the effluent of their gas-works to find its way into it.

Mr. EVE, K.C., who appeared for the plaintiffs, said he understood that the defendants were not in a position to dispute the evidence. He suggested that the Company might submit to a perpetual injunction at this stage of the proceedings, and said he would be willing that its operation should be suspended for a reasonable time to enable them to make some other arrangement.

Mr. DANCKWERTS, who represented the defendants, said this was not quite the position. He was willing to submit to an interim injunction, but not to a perpetual injunction, as there were other questions to be decided in the action. He must also ask that the operation of the injunction should be suspended for six weeks.

Mr. EVE thought this period too long, though he said he should not object to it if the injunction were made perpetual. With diligence, the action might be brought on for trial within six weeks, and the injunction rendered useless.

Mr. DANCKWERTS pointed out that the works in question supplied the whole town of Portsmouth with gas.

Mr. EVE said the matter was a serious one for his clients. The land through which the water flowed formed part of a dairy farm; and they were unable to turn their cattle out on it.

Justice SWINFEN EADY said it was unusual to suspend the operation of an interim injunction for any length of time.

Mr. DANCKWERTS said he was aware of that, and his Lordship was at liberty to plunge Portsmouth into partial darkness. The defendants were making arrangements to divert the water, which was the overflow from a large settling-tank, so that it should not get out of the works.

Mr. EVE suggested that if the motion stood over for a week, his friend might be instructed to consent to a perpetual injunction.

This course was ultimately adopted; Mr. EVE intimating that unless a perpetual injunction were consented to on the next occasion he should press for an order.

The Kinder Reservoir Contractor's Claim.

For several days before the Christmas Vacation, Mr. Justice Walton was engaged in hearing, in the King's Bench Division of the High Court of Justice, an action brought by Mr. A. Kellett against the Stockport Corporation, to recover a sum of £12,155 for work done and materials supplied in connection with the construction of the Kinder reservoir at Hayfield, in Derbyshire. The contract held by the plaintiff was entered into on May 12, 1903; and his contention was that the work for which the claim was made was outside the terms of that document. The case had previously come before his Lordship at Manchester in July, as was reported in the "JOURNAL" at the time [see Vol. XCI., p. 324]; and the question on which he heard evidence was whether the work in respect of which the action was brought was or was not within the contract. His Lordship held that it was. In his Lordship's judgment, it was extra and varying work within the meaning of clause 10 of the specification, and therefore fell, at any rate *primâ facie*, within that clause and the conditions as to payment contained therein. Mr. Kellett, however, sought to set up that there were other reasons, apart from the character of the work, why clause 10 should not apply. Mr. Rufus Isaacs, K.C., Mr. Langdon, K.C., Mr. Norman Craig, and Mr. Spedding appeared for the plaintiff; Mr. Pickford, K.C., and Mr. Sutton represented the Corporation. After hearing the case further, on various contentions set up by Mr. Kellet in amendment of the pleadings, his Lordship took time to consider his judgment. This he delivered a few days ago. He held that the work was not to be paid for until a certificate by the Engineer was given; and this had not been done. Judgment was therefore given for the Corporation. A stay of execution was granted pending an appeal.

A Meter Disconnecting Case at Hull.

The Recorder for Hull (Mr. Harold Thomas) and a Jury, had before them, at the recent Quarter Sessions of the city, a labourer named Lowsley, who pleaded "Not guilty" to an indictment charging him with stealing a quantity of gas from the British Gaslight Company on Dec. 3, by introducing a pipe for the purpose of consuming it without its having passed through the meter. For the prosecution, it was stated that prisoner took a house, and had a meter put in by the Gas Company. This meter he afterwards disconnected, fixing a lead pipe in such a manner that the gas entered the house without registration. Prisoner, however, in giving evidence, said that though the house was taken in his name he was really only the lodger. The man with whom he lived was the one who disconnected the meter. The prisoner was acquitted of the charge; and he was then further indicted for stealing a lead pipe from the house next to the one taken in his name. Evidence was given that Lowsley had admitted taking the pipe; and he was found "guilty," and sentenced to eight months' imprisonment.

Claim for Duty on a Gas Company's Motor-Car.

At the Tower Bridge Police Court, last Wednesday, the South Metropolitan Gas Company were summoned by the Excise authorities for "keeping a carriage without a licence." Mr. Shaw said that the vehicle in question was a motor-car, and the defendants claimed that it was exempt from duty. It was in all respects similar to the cars used for pleasure purposes, but it had a box fitted at the back, and bore a prominent inscription of the name of the Company. The box was used to convey gas burners and fittings; and an inspector used the car to take him on his rounds. The Excise authorities contended that it was not exempt, because it was not constructed or adapted solely for the purpose of carrying goods or burdens. Mr. W. C. Marshall, an officer of the Inland Revenue, said that from the car's construction and upholstery he considered it was liable to duty. Mr. Simon (the new M.P. for Walthamstow) submitted, for the defence, that the three conditions of exemption which the statute prescribed had been satisfied—namely, that the vehicle had been constructed or adapted for the carriage of goods or burdens in trade or husbandry; that it had been solely used for this purpose; and that the name of the owners was conspicuously displayed. In the case of *Moore v. Lewis*, it was held that an ordinary governess-car, which was used for the conveyance of old clothes, was exempt. So also was a commercial traveller's brougham. Mr. Shaw said that a traveller's brougham was lined with shelves. A doctor's brougham would not be exempt because it carried a case of instruments. Mr. Cecil Chapman held that the car was liable to duty, because it was not constructed or adapted solely for the conveyance of goods; and he imposed a fine of £2 2s., and 2s. costs.

Theft of a Slot Meter and its Contents.

At Carlisle, last Friday, Harold Armstrong, a boy of 14, was charged with stealing a slot meter and 1s. 3d. belonging to the Corporation, from an unoccupied house, on the 30th ult. On the day named, the prisoner was observed going out of the house by the tenant of the next premises. Inquiries were made, and it was found that the meter had been taken away, the gas-piping cut, and the box containing the coppers removed. John Watson, who formerly resided in the house, spoke to all the doors and windows being secured, and the meter in good order, when he left. There was about 1s. 6d. in the meter, which he identified. Alfred Atkinson, inspector of gas-meters, spoke to taking the register of the meter on the 14th of December, when it was all right. At the time of the theft, he thought, judging from the index, the meter would contain about 2s. 7d. They had had a good deal of trouble with regard to similar thefts. Sergeant Baker produced the implements which the boy admitted he had used, and said he found the meter had been torn away from the wall in the kitchen, and was lying in the washhouse. He arrested the prisoner, who, after pleading guilty, told him that he took the meter to the beck side, broke it open, and, after abstracting the money, took it back again to the house. Detective-Sergeant Pattinson said the boy had been very troublesome to the police, and a number of charges had been made against him, which, however, had been settled. The Bench sent the boy to a reformatory for five years.

A Novel Gas-Meter Case.

At Belfast, last Wednesday, Charles Woodside was summoned by the Corporation for having fraudulently hindered a gas-meter from registering the full quantity of gas supplied to his premises, and also for having fraudently used gas contrary to the statute. On behalf of the Corporation it was stated that the meter in question, at defendant's drapery shop, had the coupling at the top removed and the drum inside punctured in several places, thus allowing gas to pass without registration; but it was admitted, both by the Chief Inspector (Mr. A. M'I. Cleland) and a Meter Inspector, that the defendant and his wife had themselves complained about the working of the meter. Mr. Cleland said the only way in which the damage could have been done was by removing the coupling at the top of the meter, and pushing an instrument down the hole into the drum. It was absolutely impossible for the holes to get there by accident. Damage to the extent of 25s. had been done to the meter; while the unregistered gas had also been burnt. In cross-examination, witness admitted that the meter was placed on the premises in 1902, when another tenant was in possession. Besides this, the house was empty for a month between the old tenant's departure and defendant going in. At this stage, the case was adjourned for a fortnight.

Prepayment Meter Thefts.

Fifteen months' hard labour, to be followed by two years' police supervision, was the sentence passed at the Birmingham Quarter Sessions on William Mullens, who was found guilty of stealing 13s. 10d. from a prepayment meter. The prisoner (with other men) was seen by a constable trying cellar fittings; and when captured, he was found to have no less than 214 pennies in his possession. He was described by the police as "a most expert gas-meter thief," and the leader of a gang that had infested the district in which the robbery took place. At the Ruthin Assizes, a musical artiste and a cinematograph operator (named respectively Jones and Brain) were found guilty by a Jury of having stolen 30s. belonging to the Wrexham Gas Company from a meter in a Coedpoeth hotel last December; and Mr. Justice Lawrance sentenced Jones (against whom there was a previous conviction) to three months' hard labour—Brain being bound over. The prisoners saw the landlord put a shilling in the meter; and learnt from him that he did this every day. After the meter had been broken open, Jones (who had previously endeavoured to borrow money from the landlord) produced a handful of shillings while paying for drinks at another hotel in the place.

Gas Supersedes Electricity in Wandsworth.

At the meeting last Wednesday of the Wandsworth Borough Council, the Highways and Lighting Committee reported that, the contract with the Mitcham and Wimbledon District Gas Company for lighting the streets in the part of the borough supplied with gas having expired, they had been in communication with the Company with regard to the terms on which they would renew the contract. The Committee had also before them proposals for lighting the main road through Tooting with electric lamps. Having considered all the circumstances, they recommended that the offer of the Company be accepted, the contract to be for a period of five years. The terms of the contract were not disclosed in the report; but it was stated that under the new arrangement the lighting of the streets would be very greatly improved without any capital expenditure by the Council, and the annual cost would be less than at present. The report and recommendation were adopted. In a further report, the Committee stated that they had had under consideration complaints which had been received of the inadequate lighting of streets in Tooting in which there are incandescent electric lamps, the current for which is supplied from the dust destructor, and had come to the conclusion that the streets in question could not be efficiently lighted by this method. The Mitcham and Wimbledon District Gas Company were willing to convert the existing lamps into incandescent gas-lamps without charge; and so the Committee recommended that their offer be accepted. The sum of £60 per annum was credited to the dust account in respect to the present system of lighting; and it was stated that the annual cost of lighting the streets with gas would be practically the same. The report and recommendation were adopted.

MISCELLANEOUS NEWS.

LOCOMOTIVES AND WAGGONS ON RAILWAY SIDINGS.

Regulations for the Safety of Workmen.

At the Caxton Hall, Westminster, last Tuesday, Mr. H. H. S. Cunynghame, the Legal Adviser of the Home Office, met a deputation of factory owners who use locomotives and waggons in their works, to see if they could agree on a rule for securing safety to workmen without making structural alterations that would be of a costly character in existing and future buildings. About fifty representatives of the traders attended a meeting the previous day; and it was agreed to leave their case in the hands of Mr. T. Ratcliffe Ellis (the Secretary of the Mining Association of Great Britain); while Mr. L. N. S. Pasmore represented the Gaslight and Coke, the South Metropolitan, and the Commercial Gas Companies; Mr. Blyth, some of the Suburban Companies; and Mr. Beveridge, the Scottish Corporation. The discussion took place on two drafted rules—one submitted by Mr. Cunynghame and the other by Mr. Ellis; and it was ultimately decided that Mr. Chester Jones, the Commissioner appointed by the Home Office, should meet the deputation on Thursday in order to further discuss the draft rules, and make his report to the Home Secretary.

The draft rule submitted by the Home Office was as follows:—

1. (*a*).—Wherever, except at junctions, persons employed have to work or pass on foot between any two lines of rails, the distance between the lines shall, where reasonably practicable, having regard to the expense involved, the space available, the nature and extent of the traffic, and the exigencies of any actual process of manufacture, be such as to enable such persons to work or pass in safety. Where such distance is not reasonably practicable, efficient means shall be taken to prevent danger to persons employed by providing suitable ways and prohibiting passing between lines, or by other suitable and reasonable provisions or rules, which prohibitions and rules shall be duly notified and enforced.

Where persons employed have to work or pass on foot between a line of rails and any fixed structure above the ground level other than a platform or place used for loading or unloading, the distance between such line and such structure shall, where reasonably practicable, having regard to the expense involved, the space available, the nature and extent of the traffic, and the exigencies of any actual process of manufacture, be such as to enable such persons to work or pass in safety. Where such distance is not reasonably practicable, efficient means shall be taken to prevent danger to persons employed by providing adequate recesses at intervals of not more than 20 yards, or, in the case of existing structures, by prohibiting passing between such lines and structures, or by other suitable and reasonable provisions or rules, which prohibitions and rules shall be duly notified and enforced.

This regulation shall not apply to vertical cranes.

The traders' draft rule, as modified by the discussion, and as submitted with the Home Office rule to Mr. Chester Jones on Thursday, was as follows:—

1 (*a*).—Where, except at junctions, persons employed have to pass on foot or work between any two lines of rails, the distance between such lines, where the provision thereof is reasonably practicable, having regard, among other things, to the expense involved, the space available, the nature and extent of the traffic, and the exigencies of any actual process of manufacture shall be such as to enable such persons to pass in safety between locomotives or waggons on such lines; and in computing this distance, any load carried at a less height from the rail than 6 ft. 6 in. shall be deemed to be part of the waggon on which it is carried. Where the provision of such distance is not reasonably practicable, efficient means shall be taken to prevent danger to persons employed, either by suitable and reasonable provisions or by rules duly notified and enforced, or by the provision of suitable ways for such persons.

Where persons employed have to pass on foot or work between a line of rails and any fixed structure above the ground level other than a platform or place used for loading or unloading, and there is not sufficient space for them to work or pass in safety, efficient means, having regard as aforesaid, shall be taken to prevent danger to such persons, either by suitable and reasonable provisions or by rules duly notified and enforced, or by the provision of adequate recesses at intervals of not more than 20 yards.

Provided that this regulation shall not apply to vertical cranes.

Provided always that, subject and without prejudice to section 17 of the Factory and Workshops Act, 1901, where the provision of such distance involves the alteration of a line of rails, or of a structure erected or in course of erection at the date of these regulations coming into force, such provision shall not be required as reasonably practicable.

Mr. CUNYNGHAME said the Home Office wanted power given to their Inspector to take an occupier before a Magistrate or a specially appointed Commissioner to decide what alterations were necessary where danger was apprehended; and if the Factory and Workshops Act did not give them power, they must get it from Parliament.

Mr. ELLIS replied that they were as anxious as the Home Office for the safety of the workmen; and the Factory and Workshops Act gave them power over dangerous structures, and more was not really necessary.

Mr. CHESTER JONES said the Act was so doubtful that he considered it worthless for securing safety, and he would do his best, in reporting to the Home Secretary, to secure what both parties desired—viz., to provide some means for avoiding preventable accidents.

THE SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 349.]

The following are the principal portions of the accounts of the above-named Company for the six months ending the 31st of December last, which, with the report, will be presented at the half-yearly meeting on the 14th inst.:—

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £238,776 (Act of 1901) of stock; while the

latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,096,554; nominal amount added by conversion (less premium), £3,048,891—total, £8,145,445. The items of expenditure are as follows:—

Capital account to June 30, 1905			£4,825,168 5 3
Expenditure during half year to Dec. 31, 1905, viz.—			
New buildings and machinery in extension of works	£1,517 19 6		
New and additional mains and services	15,683 19 3		
New and additional meters	14,681 3 8		
New and additional stoves	8,091 7 11		
		39,974 10 4	
Total expenditure			£4,865,142 15 7
Balance			231,411 4 5
			£5,096,554 0 0
Nominal amount added by conversion, less premium			3,048,891 0 0
Total			£8,145,445 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coal into store, including £26,442 3s. 4d. for labour.	£327,436 19 6		
Purification, including £10,924 17s. 9d. for labour	16,591 19 8		
Salaries of Engineer and Officers at works	12,104 5 0		
Wages (carbonizing)	60,723 5 3		
Repairs and maintenance of works and plant, including £52,605 15s. 6d. for labour, less £4423 16s. 3d. received for old materials	91,104 9 0		
		£507,960 18 5	
Co-partnership		18,000 0 0	
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes, including £19,226 17s. 9d. for labour	£29,144 7 11		
Salaries and wages of officers, including Rental Clerks	16,335 7 8		
Repairing and renewals of meters, including £4607 0s. 7d. for labour	25,994 8 3		
Repairing and renewals of stoves, including £10,115 13s. 1d. for labour	19,751 0 3		
		91,225 4 1	
Public lamps, including £10,369 15s. 10d. for labour, and £6238 18s. 1d. for materials, less £16,098 8s. 3d. received for maintenance		510 5 8	
Rents, rates, and taxes—			
Rents payable	£1,018 6 10		
Rates and taxes	39,291 9 1		
		40,309 15 11	
Management—			
Directors' allowance	£2,404 19 3		
Salaries of Secretary, Accountant, and Clerks	3,140 3 5		
Collectors { Ordinary	5,265 10 1		
Collectors { Slot meter	7,152 11 8		
Stationery and printing	2,749 19 9		
General charges	7,942 1 9		
Company's Auditors	112 10 0		
		28,767 15 11	
Law charges	£792 8 4		
Parliamentary charges	2,927 3 1		
		3,719 11 5	
Bad debts		1,635 8 7	
Pensions and officers and workmen's superannuation, sick, and accident funds		6,142 16 10	
Gas Referees and Official Auditor		360 17 7	
Total expenditure		£698,632 14 5	
Balance carried to net revenue account		187,915 11 5	
		£886,548 5 10	

Receipts.

Sale of gas—			
Michaelmas, at 2s. per 1000 feet	£232,315 10 5		
Christmas, at 2s. per 1000 feet	345,863 2 9		
	£578,178 13 2		
Public lighting	14,686 16 8		
		£592,865 9 10	
Meters in use (302,625)—			
Company's meters at rent: Ordinary, 103,091; slot, 190,640	£32,707 4 6		
Company's stoves at rent: Ordinary, 69,802; slot, 162,005; fires, 20,511	26,417 5 5		
		59,124 9 11	
Residual products—			
Coke, less £1730 12s. 5d. for cartage; £16,448 0s. 1d. for labour, &c.	£136,199 1 2		
Breeze, less £225 15s. 10d. for cartage; £2444 6s. 11d. for labour, &c.	7,140 4 11		
Tar and tar products, less £4255 2s. for labour	34,510 17 2		
Sulphate of ammonia, less £4839 17s. 6d. for labour	54,942 12 5		
		232,792 15 8	
Rents receivable		1,676 2 11	
Transfer fees		89 7 6	
Total receipts		£886,548 5 10	

The net revenue account shows a sum of £177,558 3s. 11d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on the 31st of December last were as follows: Reserve fund, £174,305; renewal fund, £23,962; insurance fund, £105,189.

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store June 30, 1905.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store Dec. 31, 1905.
Tons. 57,563	Tons. 657,653	Tons. 603,130	Tons. 847	Tons. 111,239

Statement of Residual Products.

Description.	In Store June 30, 1905.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store Dec. 31, 1905.
Coke—cwts.	83,826	7,378,852	1,911,221	6,025,267	126,190
Breeze—yards	11,485	130,911	45,112	71,152	26,132
Tar—gallons	695,902	5,702,763	5,483,561	115,234	799,870
Ammoniacal liquor—butts	13,738	184,950	182,015	..	16,673

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,529,462	Thousands. 182,760	Thousands. 5,874,527	Thousands. 6,133,239	21,850 incandes't 1,029 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £60,175; coke and breeze, £4665; tar, sulphate, and ammoniacal liquor, £55,754; and sundries, £262,712. The figures this time last year were: Coal, £60,969; coke and breeze, £24,799; tar, sulphate, and ammoniacal liquor, £53,103; and sundries, £242,450. A sum of £65,596, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £30,942. The figures last year were £45,423 and £24,298. The new item, "Monazite sand suspense account," now stands at £24,139, compared with £19,143 at the end of June.

FATALITIES AT THE BECKTON GAS-WORKS.

On Friday, the 26th ult., an inquest was held at the Canning Town Public Hall, by Mr. G. E. Hilleary, the Coroner for West Ham, on the body of James Mallaly (30), a labourer employed at the Beckton Gas-Works. Mr. H. Luxton (Messrs. Monier-Williams and Robinson), who appeared on behalf of the Gaslight and Coke Company, said they desired to express their sincere regret at the accident, and to render every possible assistance in the inquiry. According to the evidence of Walter Cooper, a foreman, the deceased was engaged in putting soda, for the purposes of drying, into the centrifugal machine, which had on the top two large lids with a diameter of 6 feet. The soda was brought to the machine, and by means of spades put into a tank, and dropped into the coppers. The lids were then placed on top; their own weight being sufficient to keep them in position. The machine was started by steam, and it worked at the rate of some 150 revolutions per minute. By some means, one of the lids was slung round and smashed; the deceased being hit, and severely injured on the skull. He was taken at once to the Seamen's Hospital, where he died soon after his admission. James Farndell said he was working with the deceased, some 15 yards away. About three o'clock he heard a noise, and, looking up from his work, saw one of the lids turn round. He made a rush and saw the deceased roll out of the archway just against the machine. He was quite unconscious. Dr. John M'Vail, House Surgeon at the hospital, stated that the deceased was suffering from a compound fracture of the right leg, laceration of the right thigh, and fractured skull; the last-named injury being the cause of death. The Jury returned a verdict of "Accidental death;" stating that there was not enough evidence to show where the deceased was first struck by the cover of the machine.

Last Wednesday, Mr. Hilleary held an inquiry at the Coroner's Court, Canning Town, into the death of Joseph Ship (40), who was killed at the Beckton Gas-Works on the day of the accident just referred to. Mr. Luxton again appeared for the Gas Company. William Edward Collyer, a painter, said he was working with the deceased in a locomotive running shed, fitting an iron hook on to the girder of the roof, for the purpose of putting up some scaffolding, some portion of which had already been fixed. There were iron hooks or brackets through which poles went, and then boards were placed on them. The deceased was standing on one of the planks when it tilted, and he saw him fall. He was about 10 feet away. He sent for assistance, picked up the iron socket, and found one end broken; but he could not say what caused it to break. James Conduit said he was assisting the deceased to erect the scaffolding, but was working in the pit on the ground. He saw the piece of iron after the accident, when it was broken. The deceased fixed the bracket himself. Charles Limy said he was foreman on the job upon which Ship was engaged. He never gave him sanction to use that particular piece of iron, and would have stopped him if he had known he was going to use it, because he had another, and he considered a better, method of doing the work. The piece of iron, showing the fracture, was produced to the Jury, and a Juryman remarked that it looked very old and rusty. Mr. Luxton pointed out that it had fallen in a place where there was a lot of water, and this would account for the rust. Dr. M'Vail said the deceased was brought to the Seamen's Hospital about half-past five on the 26th ult., and died the following Tuesday morning; remaining unconscious the whole time. The cause of death was fractured skull. The Jury returned a verdict of "Accidental death," from a defective bracket.

Manchester Corporation Bill.—In consequence of the defeat of the Manchester Corporation Bill at a public meeting, the City Council have resolved to take a poll of the ratepayers. Among the other matters referrred to in the 81 sections of the Bill is the purchase of the portion of the Stretford Gas Company's undertaking which lies within the township of Chorlton-cum-Hardy.

Gas Explosions.—Owing to escaping gas finding its way into a house at Bilston, last Thursday week, there was an explosion, by which some injury was caused to two of the inmates—a man and a boy. An unpleasant smell had been noticed; and this was attributed to "foul air" issuing from a cupboard in the kitchen, under which was an old cistern. An unwise attempt to test the correctness of this theory by means of a poker taken from the fire, seems, from the newspaper reports, to have been the immediate cause of the accident. At Ipswich, on the following morning, an aged lady living alone was injured by an explosion which arose from a leakage of gas under the floor of one of the rooms; the gas having apparently accumulated until it came in contact with some light left burning. As a result, a great part of the back of the house was severely damaged.

THE GASLIGHT AND COKE COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held on Friday, at the Chief Offices, Horseferry Road, Westminster—Mr. CORBET WOODALL presiding.

THE GOVERNOR'S ILLNESS.

The CHAIRMAN: Ladies and gentlemen, it is with deep regret that I have to report that Sir William Thomas Makins, the Governor of the Company, is seriously ill. It is for this reason that he is not here to-day, and that the report was signed by the Deputy-Governor (Mr. Howard Charles Ward). After the last general meeting, the Governor's health improved materially, and he was able to be with us till December, at which time he had a relapse, and has since been obliged to keep to his home. He has applied for three months' relief from the duties of his office; and, at the request of Mr. Ward and my colleagues, I have agreed to occupy the Governor's place as *locum tenens* during that period. I may say that I cannot hope to bring to the duties the personal charm which characterized the Governor's relations with those who served with him; but what experience and capacity I have will be devoted as completely as is possible to the service of the Company and to minimizing the loss which we are experiencing—a loss which I hope, and I am sure you all hope, will be but temporary. I will now ask the Secretary to read the notice convening the meeting.

OPENING BUSINESS.

The SECRETARY (Mr. H. Rayner) accordingly read the notice; and the seal of the Company having been affixed to the register of proprietors, the report and accounts, which were given in the "JOURNAL" last week, were taken as read.

REPORT AND ACCOUNTS—EXPLANATION OF THE DEFICIENCY.

The CHAIRMAN: The salient feature of the accounts which has doubtless attracted most attention is the balance of the revenue account, which is less by £36,109 than the sum necessary for the payment of the dividend recommended. In the half year to June, 1905, there was a deficiency of £30,785; and in the previous half—that to Christmas, 1904—the dividend was not earned by £25,783. These three consecutive deficiencies amount together to £92,677. This statement, standing alone, may well cause some anxiety, for which, however, a proper appreciation of the facts will show that there is no substantial ground. In June, 1904, the balance at the credit of the profit and loss account, after payment of dividends, amounted to £273,976. Careful estimates were prepared, from which it appeared that the year to June, 1905, should yield a further net profit of £36,000. Upon this, the Directors decided to reduce the price of gas by 1d. per 1000 cubic feet, which, with some adjustments of discounts, meant a surrender of £87,000 in favour of the consumers. We had then, an estimated gain in the year of £36,000, and against it a reduction of income of £87,000, or an inroad of £51,000 upon our balance. The actual deficiency was £56,000, or £5000 more than the estimate. From this it should be clear that the deficiencies have not been regrettable incidents in the sense of unexpected falling away of profit, but elements in the trading deliberately provided for. The excellent prices obtained for coke and pitch in 1904 had dwindled sadly in 1905, and the estimates for the second half—that with which we are dealing to-day—disclosed a *minus* of £59,000. Thanks to a slight increase of business and to certain economies to which I shall refer directly, the result is better than the estimate by £23,000. Comparing the undivided balance of two years ago with that of to-day, there is an increase of about £6000. The revenue from coke alone in the past half year was less by £85,000 than in the June half of 1904, upon the accounts of which the last reduction in the price of gas was made. Such a falling away naturally upsets estimates; but had it been foreseen, we would still have reduced the price of gas. To those who study the accounts, the conjunction of the known fall in the value of residuals with a concession to the consumers of nearly £45,000 for the half year should prevent surprise that the balance of profit and loss, accumulated for the purpose, is drawn upon to some extent for dividend.

DETAILS OF THE REVENUE AND CAPITAL ACCOUNTS.

Looking at the revenue account a little more in detail, it is to be noted that the quantity of gas paid for shows an increase of 1¼ per cent. over the 2 per cent. increase of this time last year. The revenue derived from this increase is a little over £14,000. The income from stove-rental is larger by £2600. Ammonia has yielded more by £9000; and there has been a saving in the cost of coal and oil of a like amount. These items add up to a total of £34,600, against which the returns for coke and tar show a decrease of £38,000—the two sums approximately balancing one another. The working figures show several satisfactory features. Manufacturing wages are less by £7500; or, if compared with the corresponding half of two years ago, they are less by £17,000. This is due to two causes—first, the largely increased use of machinery in the retort-houses; and, secondly, to improved results obtained from the coal. Upon purification, there has been a saving of £5000; on the other hand, the amount spent on wear and tear of works is higher by £8000. There has been charged against wear and tear in the past half year a special sum of £10,000 on account of the small gasholders now being removed from the Monck Street station adjoining these offices, and £4400 for certain apparatus for reburning lime at Beckton, which is no longer needed. It will interest the shareholders to know that during the last six years more than £200,000 has been spent in reconstructions of works and plant, in addition to the ordinary charges for upkeep. This has, of course, been a heavy charge against revenue; but I am quite satisfied that the investment has been a sound and productive one. One effect of the reconstructions has been to increase the producing capacity of the stations dealt with by 10 million cubic feet daily. This has enabled us to discontinue manufacturing in three stations where, because of their situation, the cost was high, and to concentrate the production where it could be carried on more economically. The capital account shows an expenditure during the half year of £88,000, which is reduced by £36,000 obtained partly by the sale of surplus land (chiefly a plot of land in Millbank Street, bought for the purpose of improving that thoroughfare), and partly by sums brought from revenue for depreciation, to which I have referred; the net addition to capital thus being £52,000. Of the gross expenditure, £75,000 is upon distribution, chiefly prepayment meter work; the balance of £13,000 only being charged against works.

INCREASE IN CONSUMERS—IMPROVED LIGHTING.

The increase in the number of ordinary and automatic consumers continues to be satisfactory, as also in the number of stoves sold and let on hire. Competition has never been so severe as it is at present. Producer plants of the so-called "suction" type, added to electricity at 1d. per unit—a price at which it is an absolute loss to the distributors—are competitors for power supply; and it is a matter for congratulation that we are holding our own in the struggle. If we are to keep the lead, it is essential that the price of gas should be kept low; and the efforts of the Directors and staff are constantly given to assure this. At the last half-yearly meeting, the proprietors were told that the City authorities had decided to instal gas lighting on the incandescent and high-pressure systems experimentally in several important streets in the City. This installation has now been completed and in operation for some months; and we believe it has given much satisfaction to the authorities, who are anxious to make the City streets the best lighted in the Metropolis. Another important piece of lighting is Broad Street Railway Station. This station was formerly lighted by flat-flame gas-burners, giving a total illumination of 8000 candles for a cost of £1017. Now there is a light of 40,000 candles; and the estimated cost is £706 per annum.

RELATIONS WITH THE CONSUMERS.

I am happy to say that the relationship between the Company and the great majority of the consumers is cordial. The Company recognize that the best way of retaining old, and obtaining new, business is by meeting the wants of consumers and consulting their convenience. Two years ago, we started a department for the maintenance of mantles; charging 9d. a quarter per burner for the work. The consumers have largely availed themselves of this service; and at the close of last year the number under inspection was 149,000. This is not only evidence of the general growth of the Company's business, but also, I think, of the fact that their work in this direction is well done and appreciated. In connection with stoves, the Directors have felt that dissatisfaction often arises from the fact that the consumer does not know how to use a gas-stove to the best advantage. They have therefore engaged the services of a lady who is not only an expert in the manipulation of gas cooking-stoves, but is also a thoroughly competent cook, and who has recently been employed in lecturing for the Company. Her duty will be to call on consumers who desire information with regard to the use of their gas-cookers, and advise them on such matters. It is of paramount importance to the Company that the apparatus they supply should be thoroughly efficient, and such as to give consumers satisfaction. Temporary defects must necessarily show themselves at times; but if, when this is the case, consumers will communicate with the Company at once, there is an ample staff ready and able to deal with such complaints quickly and effectually.

REDUCED ASSESSMENTS.

The quinquennial revision of assessments has just been completed, and has resulted in reductions of the rateable value of the Company's property by a gross amount of over £48,000. This is satisfactory in a measure; but the assessments are still oppressively high. The hearty thanks of the shareholders are due to Mr. Watson, the General Manager, and to Mr. Bevis, the Accountant, for the zeal and great ability with which they have, in conjunction with our professional advisers, prepared and conducted the case of the Company.

THE QUESTION OF METER-RENTS.

As you are aware, the Company do not charge any rent for meters. Whatever the circumstances may have been ten years ago, when the charge was abolished, some circumstances of the present time make it desirable to reconsider the question. There are now scattered over the district of the Company about 7000 meters, some of them of large size, through which no gas, or so little as to be negligible, passed during the year. These are kept in place largely as a stand-by in case of failure of another system of lighting. They represent a considerable amount of capital which is unproductive. If meter-rents were paid as elsewhere throughout London, we should, from the revenue so obtained, be able to reduce the price of gas by 1d. per 1000 cubic feet; and the change would, I think, be regarded with satisfaction by the consumers generally. When the price of gas in London is spoken of, these free meters are not generally borne in mind. The circumstance is forgotten, as is the case also with the higher quality of the gas supplied by the Company. Where there is no wish to remember, it is easy to forget.

THE LONDON GAS ACT AND SULPHUR PURIFICATION.

With the commencement of the year, the London Gas Act, 1905, came into operation. By the courtesy of the London County Council, the portions of the Act affecting sulphur purification were allowed to have effect from the end of September; and the Engineers of the various stations have thus had their anxieties lightened through the winter, and the workmen been saved from a very objectionable occupation. We welcome the passing of the Act because of the relief it affords the Company from vexatious and occasionally humiliating conditions, which have been of little service to the consumers, while they have been fruitful of occasions for difference and dispute between the Company and the County Council and other authorities. The passing of the Act will tend to some extent to cheapen manufacture. So far as this is the case, the advantage will go almost wholly to the consumers. It is with pleasure that we acknowledge the important part that was played by

Sir George Livesey in securing these reforms. It was he especially who called the attention of Parliament and the public to the questions which were eventually referred to the Departmental Committee; and the ultimate satisfactory issue was due in great measure to his persistency and his courage.

HEAVY MOTOR TRAFFIC.

There is another matter which I must refer to, and that is the damage done to the Company's mains in the streets by heavy motor traffic. In the year 1899, in the leading thoroughfares of the Company's district, we had 87 cases of broken mains and drawn joints; while last year, dealing with the same thoroughfares, we had as many as 687. This constitutes a great danger, and puts the Company to very heavy expense. The Distributing Engineer of the Company (Mr. G. F. L. Foulger) gave evidence on the subject before the Royal Commission on Motor Cars; and it is to be hoped that the Commission will see their way to recommend a modification of the present law in the direction of limiting the weight of heavy motors used in the streets and the pace at which they are allowed to travel.

THE AUDITORSHIP.

The Company have recently suffered a very distinct loss in the death of Mr. Allen Stoneham, who had held the office of Auditor for the past ten years—an office for which his long connection with the Financial Department of the Board of Trade had rendered him exceptionally qualified. The proprietors will be asked at a later stage of these proceedings to elect an Auditor in his place. There are two candidates for the post—Mr. P. H. Ashworth and Mr. J. A. Stoneham—both of whom hold a qualifying amount of the Company's ordinary stock. The Directors, as Directors, can take no part in this election; the matter being essentially one for the proprietors, in whose interests the Auditors are appointed. The claims of the respective candidates are set out in the circular letters which I understand they have addressed to the holders of the Company's stock. A second vacancy in the auditorship is caused by the formal retirement of Mr. J. J. Walker, who, however, is eligible, and offers himself for re-election.

CONFIDENCE IN THE COMPANY'S FUTURE.

In conclusion, permit me to say that never, during the eight somewhat anxious and strenuous years of my connection with this Board, have I felt so much confidence in the Company's future as I do to-day. We have overtaken some arrears, and there are still possibilities of economy. We have an excellent staff, anxious to contribute to the advancement of the Company, and in healthy rivalry as to who can do most. Our future will see times of depression, no doubt; but I feel assured that its trend will be steadily towards greater prosperity. I now beg to move: "That the report and statement of accounts for the past half year be received and adopted."

The DEPUTY-GOVERNOR (Mr. Howard Charles Ward) seconded the motion.

The CHAIRMAN: I need scarcely say that if any shareholder desires to ask any questions on the accounts we shall be pleased to hear them.

VIEWS OF THE SHAREHOLDERS.

Mr. C. J. BISHOP said that, having regard to the very interesting statement which had been made as to the position of the Company, he was sorry the Chairman had not seen his way to make any reference to the future. Personally, he was sorry the Board had thought fit to recommend a dividend of £2 4s. per cent. for the half year, having regard to the large deficiency in revenue as compared with the amount to be distributed. He should be very glad if the Board would take into consideration the advisability, before the next meeting, of reconsidering the matter, and strengthening the position of the Company by making up their minds to keep the distribution within the revenue. With regard to meter-rents, he quite appreciated the difficulty which had been referred to, of having large meters as "stand-bys." Some of the gas companies in the country with which he was connected had adopted the plan of making a special charge for meter-rents, for the use of a meter as a stand-by; and in such cases he considered a rent was a desirable thing. But he could not help thinking it would be a retrograde step to re-impose a charge for meters, as it would be the first "slap in the face" for consumers before they began to use gas. He knew that many possible gas consumers would object very much, having tasted the sweets of free meters, if such a charge were again placed upon them. The idea of getting a reduction of 1d. per 1000 cubic feet of gas would not appeal to consumers so much as having meters free. He hoped the Board would consider the advisability of strengthening the position of the Company, if possible, by having a larger reserve fund. It was not so long since the Company had to meet a deficiency of more than £100,000 for obsolete plant; and, having regard to competition, they ought to take every possible means to ensure the strength of their position.

Mr. HOUNSOM said he should like, from the shareholders' side of the table, to emphasize the view expressed by the Chairman as to the action of the Governor of the Company. He had some recollection of what transpired at the half-yearly meeting three years ago; and he thought they might all, in spite of not earning the full dividend for the half year, congratulate the Company on their progress during the last three years. He might give a little instance that occurred three years ago which would quite illustrate what he meant. It was his lot to be staying in a health resort where it happened that one of the officers of the Company was also staying. That officer made this remark: "We regard every flat-flame gas-burner as an enemy"—that was to say, that the Company had come to the conclusion that the interests of the consumers and shareholders were identical. Bearing this fact in mind, he thought the large increase in the number of consumers with but a comparatively small increase in the consumption for the past year spoke volumes for the stability of the Company, because they were overlooking the diminution in the consumption consequent upon the introduction of improved forms of lighting; and it was to this fact that they must look for the future stability of the Company. For these reasons, he was extremely glad to hear the way in which the Chairman had put the position of the Company before the shareholders. Great strides had been made, and large sums had been spent in the improvement of the plant and the concentration of the work; and the shareholders would all rejoice with the Board that such had been the case. Of course, no one wished for a diminution of dividend; and he was pleased to hear that the Board did not intend to reduce it. He had no sympathy with the ups and downs of the Stock Exchange with reference to the Company's shares. A steady, substantial dividend was the best thing for all parties; and the less they saw in the accounts about "transfer fees" the better. He hoped that in the future more than in the past there would be healthy, kindly criticism all round from the shareholders, and that it would be accepted in the right spirit. As a commercial undertaking, they had to consider the shareholders, their customers, and their workmen—or, as the late Lord Beaconsfield said, the landowner, the farmer, and the labourer; and if they did this, they would go a long way towards increasing the prosperity of the undertaking instead of diminishing it.

Dr. COWBORN desired to associate himself with the remarks made by the last speaker. He was not quite clear as to what the Chairman said with regard to the meter-rents—whether he wished to impose a rent on large meters or upon all meters. If it was upon all meters, he could only think this was a step of a retrograde character. What they had to do was to attract and not repel customers. The paragraph in the report which related to the Bills was, to his mind, extremely vaguely worded. The shareholders were entitled to know what the Bills referred to were, who were the persons promoting them, and in what way they might adversely affect the Company's interests.

Mr. C. E. JONES thought the question of the abolition of meter-rents was a very serious one for the Company; and he said he should be sorry to see anything done towards reimposing such rents. No doubt there was a very heavy hardship upon the Company in the case of large meters which were absolutely earning nothing at all; and he rose to suggest whether it would not be possible for the Company to make a minimum charge for meters according to size. If such a charge were to be imposed, the Board might give instructions that anyone who passed a certain proportion of gas through his meter during the quarter should not be charged any rent.

A SHAREHOLDER asked whether the appointment of a lady to instruct consumers how to use gas-stoves would entail any considerable cost upon the Company, or whether it was merely a matter of a few pounds. He further wished to know whether this appointment would reduce the number of men now employed, because, if not, the expenses would advance in such a way that shortly the shareholders would have to go without a dividend. The remarks made by the gentleman who came up from Bath three years ago were very cogent at the present time. He spoke about the smallness of the dividend then; but now some speakers were talking about the largeness of the dividend. It was perfectly ridiculous to talk in such a manner.

SOME EXPLANATIONS.

The CHAIRMAN: I think, ladies and gentlemen, we have reason to be grateful to all the shareholders who have spoken to-day upon the report. The observations of the last shareholder throw us back, as did those of Mr. Hounsom, to three years ago. The honourable proprietor will remember that the price of the Company's stock at that time was something under 90—I think it was 87. The policy to which he is disposed to take exception has been essentially followed in the interval between then and now; and the price of the Company's stock certainly shows that we have not lowered the estimation in which the Company is held generally by the public. With regard to the observations made by Mr. Bishop in reference to three years ago, if he was present on that occasion he will remember that I spoke very strongly about the unwisdom of dividing profits up to the hilt. If I recollect rightly, I made use of this expression—that profits might sometimes well be put to better use than their division as dividend, and that the consolidation of the Company with a view to its future prosperity was of more consequence than the payment of large dividends at the moment. He will therefore see that I am in sympathy with the general idea which is in his mind; but I am glad to say I have no fear whatever as to there being any necessity for reducing the dividend at present paid to the shareholders in order to follow out that policy. You will remember that three half years ago, when it was decided to reduce the price of gas, the balance of profit in the half year was not only sufficient to pay the dividend but it showed a balance of £98,000 beyond, and that what we have parted with, by reason of the reduction in price then made, has not exhausted the surplus of that one half year. We have in the interval, as we knew we would have to do, met with hard times in the matter of the low price of residuals; and we hope—and I may say that personally I believe—we have seen the worst of them. I trust that the next consideration of the disposal of surplus profits will be rather in favour of the shareholders than otherwise. With regard to meter-rents, the reason why I mentioned the subject was the disparagement under which the Company lies whenever the price it charges for gas is compared with that of its neighbours. Now, throughout London, and I think throughout all the suburbs, meter-rents are charged. These meter-rents mean about a 1d. per 1000 cubic feet on the price of gas; it would mean that with us. The suggestion which I made—and which I beg you to understand was my own only—was with a view to our bringing the price of gas more into line for comparative purposes with that of neighbouring companies. To us it matters very little whether or not we take the money in meter-rent or in the larger price of gas; in meal or in malt, we have it. But I would prefer that we should take it in the same form as that of our neighbours, and so make, as I have said, the comparison more fair. I may say that we shall make no alteration upon the lines I hinted at without agreement with the London County Council, and with regard to the City of London without a Special Act of Parliament. The matter is consequently not one of immediate urgency; it may be considered when we are next going to Parliament. One gentleman asked for a list of the Bills which it is proposed we should watch. There is one with regard to the Thames Harbour, promoted privately, which will involve the charging of rates upon coal brought into London. Then there is a very important Bill of the London County Council with regard to electricity supply; and

there are certain other Bills which we shall need to watch. I earnestly hope that it is not going to be a costly session in this respect. I should like to say one word of grateful appreciation of the observations made by Mr. Hounsom, who is a very large shareholder in the Company, both in regard to the course pursued by the Directors in the management of the undertaking, and for the anticipation which he has expressed with regard to its future.

The motion was then put and carried unanimously.

THE DIVIDEND.

The CHAIRMAN next moved a resolution authorizing the payment of the dividend recommended in the report.

The DEPUTY-GOVERNOR seconded the motion; and it was carried unanimously.

ELECTION OF DIRECTORS—A TRIBUTE TO SIR WILLIAM MAKINS.

The CHAIRMAN: The next business is the election of three Directors in the place of those who retire. They are Sir William Thomas Makins, Mr. Howard Charles Ward, and myself. I beg to propose that we re-elect Sir William Thomas Makins to a seat on the Board. In doing so, I cannot disguise—and I have no desire to disguise—from the shareholders that the condition of Sir William is reported as serious. We hope—devoutly hope—that he will be restored to his place here. During the time that it has been my fortune to work with him, I think I may say for fully half of it I was in frequent opposition, on questions of policy, to him. But I can say this—I never lost my complete respect for him, or my admiration for his devotion to the interests of the Company. In no way did he ever spare himself; and he followed his convictions manfully. I believe it was when in opposition that one admired more the qualities of Sir William than when in agreement with him. There was constantly that courteous consideration for opponents that has endeared him to those who served with him and under him.

Mr. HOUNSOM: I beg to second the motion. It has been my duty at times to criticize the policy of the Company, and therefore it gives me a double pleasure to-day to second the motion for the re-election of Sir William Makins You have hinted, Sir, that even Boards do not always agree among themselves; but in Sir William Makins we have had one who has conscientiously endeavoured, to the utmost of his ability, to carry out the duties of a very high and important office. With the regret which I expressed a few moments ago I should like to couple the re-election; and I hope it will go to Sir William from this meeting that not only has he been re-elected, but that the re-election was coupled with the sympathetic feeling expressed to-day. (Hear, hear.) I hope, Sir, you will communicate to Sir William the feeling of this meeting. (Hear, hear.)

The resolution was carried unanimously.

The CHAIRMAN: It is now my pleasant duty to propose the re-election of Mr. Howard Charles Ward as a Director of the Company. Mr. Ward has occupied a seat on the Board for a very long time, and his acquaintance with the circumstances of the Company is unique.

Mr. ULICK J. BURKE seconded the motion, which was put and carried unanimously.

Mr. WARD, in returning thanks, said he had been a Director of the Company for 56 years, so that the proprietors might be sure he was tolerably well acquainted with its working.

Mr. Woodall then vacated the chair, and it was taken by Mr. Burke.

Mr. BURKE said it was his privilege to propose the re-election of Mr. Corbet Woodall. He was sure the proprietors did not want to hear many words from him in support of the resolution. Mr. Woodall's close touch with everything connected with their enterprise was a point upon which he must congratulate the shareholders; and it was with great confidence that he (Mr. Burke) asked them to re-elect him.

The DEPUTY-GOVERNOR, in seconding the motion, referred to Mr. Woodall as one of the "shining lights" in the gas world; and they knew him to be a most efficient Engineer.

The motion was unanimously adopted.

Mr. WOODALL expressed his thanks for his re-election, and assured the proprietors that his interest in the undertaking grew every week that passed. He hoped the words he had used would be verified in the near future of the Company.

ELECTION OF AUDITORS.

Mr. J. J. Walker was unanimously re-elected an Auditor of the Company; and, on the motion of Mr. I. A. CROOKENDEN, seconded by Mr. P. H. ASHWORTH, Mr. John Allen Stoneham was elected an Auditor in the place of Mr. Allen Stoneham, deceased.

SALE OF SURPLUS LAND.

A resolution was next passed sanctioning the sale of a small strip of land at Nine Elms, which was sought to be acquired for the purpose of widening the road.

The CHAIRMAN then thanked the proprietors for their attendance, and for the support they had given to the policy of the Company.

VOTES OF THANKS.

Mr. C. E. JONES proposed that the best thanks of the meeting be given to the Chairman for presiding, and to the Board, Engineers, Secretary, staff, and employees, for their devoted service to the Company. In doing so, he said he heartily endorsed what had been said about the worthy Governor. They were sorry for the cause which placed Mr. Woodall in the chair that day; but he hoped that he would convey to the Governor the deep sympathy of the proprietors in his affliction, and their devout hope for his speedy recovery.

Mr. REGINALD NEVILLE, in seconding the motion, bore testimony to the excellent services rendered by Mr. Watson (the General Manager) and his assistants, which had resulted in reducing the assessments. He said the heavy rates which were now being levied had the effect of crushing all great industries.

The resolution was passed unanimously.

The CHAIRMAN: On behalf of the Governor, my colleagues, and myself, I thank you heartily for this vote, in which I am glad that Mr. Jones has included the officers and employees. I have already said what I thought it right to say with regard to them, and especially in the case of the General Manager are our acknowledgments due for the successful way in which his work has been done. In the case of the workmen as well as the officers, the present relations are all that could be wished.

The proceedings then terminated.

BRENTFORD GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report of the Directors of this Company to be presented at the half-yearly general meeting on the 16th inst., the Directors state that the working in the six months ending the 31st of December last resulted in the production of a sum of £97,162 available for distribution; and they recommend a dividend at the rates of 5 per cent. per annum on the preference stock, 12½ per cent. per annum on the consolidated stock, and 9½ per cent. per annum on the new stock, 1881. The accounts accompanying the report show an increase of about 3 per cent. in the sale of gas during the half year. The smallness of the increase, the Directors remark, has arisen from various causes—viz., the mildness of the weather during the Christmas quarter, the increasing use of incandescent gas lighting, and the continued depression in trade. That this is so is especially evident from the fact that, though there has been an increase of only about 3 per cent. in the sales of gas, the number of consumers in the district has increased from 56,200 at Christmas, 1904, to 59,669 at Christmas, 1905. The Directors regret that the markets for the sale of secondary products—coke, tar, and ammonia—are still unfavourable; but, despite these facts the result of the half-year's working is regarded as very encouraging.

The revenue from the sale of gas in the six months covered by the accounts was £156,113, against £151,623 in the second half of 1904; and the rental of meters produced £15,586, compared with £14,758. The sale of residuals, however, yielded only £28,513, against £30,121; but the total revenue amounted to £200,250, compared with £196,541. The expenditure on the manufacture of gas came to £103,805, compared with £102,402; on distribution, to £33,445, against £28,666; on management, to £5923, against £5620; and the total expenses, to £158,298, compared with £151,325. The balance carried to the profit and loss account is £41,952; whereas this time last year it was £45,216. The working statements show that 79,604 tons of Newcastle coal, and "Solar" oil equivalent to 32,811 tons, were employed during the half year in the production of 1,230,089,000 cubic feet of gas, of which 1,119,319,000 cubic feet were sold and 1,134,319,000 cubic feet were accounted for. The estimated quantities of residuals were: Coke, 49,918 tons; breeze, 6223 tons; tar, 870,220 gallons; and ammoniacal liquor, 22,909 butts.

PROGRESS OF THE YORK GAS COMPANY.

Improved Public Lighting.

The features of special interest at the half-yearly meeting of the York United Gas Company on Thursday last were the references made to the change effected in the lighting of the city by the installation of the incandescent system. In moving the adoption of the Directors' report, the Chairman (Mr. John R. Hill, J.P.) said, with regard to the fitting up of the street-lamps with incandescent burners, he trusted the ratepayers and the public would appreciate the improvement which had been made. There were two things in gas lighting to which he desired to call attention. They were the high-power lamps for lighting the outsides of shop windows, large halls, and similar places, and the inverted incandescent burners for interior lighting, which had given the greatest satisfaction to their customers. Mr. Walker, in proposing a vote of thanks to the Directors for their services during the past half year, congratulated them on the improved lighting of the streets of the city by the recent installation of incandescent gas-burners. He said he had particularly noticed during the foggy weather that the incandescent gas-lights possessed a much higher penetrating power than even the newest style of electric arc lights, while the old kind of arc lights were altogether eclipsed by incandescent gas. The Chairman, in reply, expressed his gratification that the change in the street lighting had given satisfaction.

It may be mentioned that the report showed a balance of £8660 (including £665 brought forward); and that during the half year 1356 yards of new mains had been laid, 459 new meters fixed, and 500 cookers and boilers, 193 gas-fires, and 1579 additional lights supplied. Reviewing the progress of the Company in the past year, the Chairman had good reason to congratulate the shareholders on the result, inasmuch as they had paid their maximum dividends, placed £1000 to the reserve fund, and carried forward about £370 more on the profit and loss account than they did a year ago. At a special meeting held after the ordinary meeting, authority was given to the raising of £35,000 of redeemable debenture stock, to bear interest at the rate of 3¾ per cent. per annum.

Gas-Works for the Amman Valley.—As already mentioned in the "JOURNAL," a Company has been formed, with a share capital of £25,000, in equal numbers of preference and ordinary shares of £1 each, to construct works for the supply of gas to Ammanford and other places in the Amman Valley; and it will be seen, from an announcement which appears elsewhere, that it is intended to issue at par 10,500 of the former, 10,190 of the latter shares, and 1250 debentures of £10 each. The preference shares carry interest at 6 per cent., and they are entitled to an additional 1 per cent. after 12 per cent. has been paid on the ordinary shares. The debentures bear interest at the rate of 5 per cent., are redeemable at 10 per cent. premium in ten years, and are a first charge on the whole of the assets of the Company. The dividend is guaranteed during the construction of the works, which will be erected under the supervision of the Company's Engineer and Manager, Mr. F. G. Vivian, of Llanelly.

OPPOSITION TO LONDON GAS BILLS.

At the Meeting of the London County Council last Tuesday, it was decided to present petitions against the Gas Companies (Removal of Sulphur Restrictions) Bill, the South Metropolitan and South Suburban Gas Bills, and the Wandsworth and Putney (Removal of Sulphur Restrictions) Bill. It was reported, at the meeting of the Tottenham Urban District Council on the same day, on the subject of the Gas Company's Bill, that the Directors had, through the Secretary (Mr. James Randall), offered to wait on the Council or a Committee to discuss the matters likely to affect the interests of the district. It was resolved to present a petition against the Bill, in order to secure *locus standi* with a view to obtaining necessary amendments and protective clauses. In the meantime, the officers were instructed to formulate these clauses. The next day, the Lewisham Borough Council resolved to petition against the South Suburban Gas Company's Bill, and to ask other authorities to join them in their opposition under an arrangement similar to that adopted last year. The Gas Examiner forwarded a report of a test of gas on the 12th ult., and called attention to the alteration by the Gas Referees in the method of testing, and expressed the opinion that the instrument in use at the Company's works does not comply with the Referees' requirements. The General Purposes Committee had this matter before them, and had, it was reported, adjourned its consideration, in view of the Bill which is being introduced by the Company in relation to the illuminating power and method of testing their gas.

SHIPLEY GAS-WORKS FINANCES.

Mr. H. P. Boulnois, on behalf of the Local Government Board, last Wednesday held an inquiry at Shipley into an application by the Urban District Council for sanction to the borrowing of £16,800 for the purposes of their gas undertaking, and £650 to be spent on public gas lighting. Mr. Lindow, the Clerk to the Council, in explaining the objects for which the money was required, stated that, though the purchase of the works from the old Company was sanctioned in 1901, the price was based on profits shown for the year ended June 30, 1899. The purchase money was £245,990. A sum of £26,000 had been spent in extensions and improvements, of which £20,000 was obtained under the Shipley Local Act of 1901. The modernizing of the works had led to large saving in the cost of manufacture. In addition to the £6000 spent beyond the £20,000, a sum of £10,000 was needed for street mains and services. Of the latter amount, £6200 had already been spent. The sum of £16,800 now in question was required to put the undertaking on a sound financial basis. Except in the last financial year, there had been no loss on the working; but for that twelve months they were £320 on the wrong side. The previous profits, however, had allowed the Council to accumulate a reserve fund of £4309. Evidence in support of the application was given by Mr. W. Newbigging, under whose advice the improvements to the works had been carried out, Mr. G. T. Wilcock (the Manager), and Mr. W. H. Dawson (the Surveyor). Mr. Morgan and Mr. Smith both addressed the Inspector on behalf of the Shipley Ratepayers' and Voters' Association. The former gentleman said that he did not object to the present application, because it was no use now to discuss the wisdom or otherwise of purchasing the gas-works. If it were to be proposed again, he did not think the purchase by the Local Authority would meet with the approval of the people of Shipley. In support of the application for permission to borrow £650 for street lighting, Mr. Lindow said that the rapid increase in house building in recent years had forced the Council to consider the question of a loan for this purpose. Sanction had been obtained to borrow money for lighting by electricity, but not for gas lighting.

BIRMINGHAM GAS COMMITTEE AND IRONMONGERS.

The Supply of Fittings and Stoves.

In the "JOURNAL" for the 16th ult. (p. 177), we reported the proceedings at an interview between a deputation representing the Birmingham Ironmongers' Association and the Master Gas-Fitters' Association and the Gas Committee of the City Council, with a view to obtaining a modification of the trading by the Committee in gas fittings and stoves. A reply has been received from the Secretary to the Gas Department (Mr. G. Hampton Barber), in which it is stated that, after mature consideration, the Committee are unable to recommend the Council to comply with the requests of the deputation. The reasons given for this decision are because the fittings business formed an asset of the gas undertaking purchased by the ratepayers in 1876, and the Committee feel that it is impossible to hand over to a section of the ratepayers a property purchased by the whole Municipality. The Committee also think that the fittings business of the Gas Department is an adjunct necessary to the convenience of customers, and essential to the development of the undertaking. The deputation at the interview stated that the Gas Department was treating the ironmongers and gas-fitters unfairly in competing with them, and that it was a difficult thing for them to carry on their business at all. Mr. Barber points out that in 1876, when the gas undertaking was acquired by the Corporation, the annual turnover with private consumers in the fittings branch of the business was £24,320, and for the five years ending March 31, 1905, the amounts were as follows: 1901, £24,271; 1902, £22,944; 1903, £24,293; 1904, £20,384; and 1905, £21,839. From these figures it is apparent that if grave inroads in the business returns of the members of the Associations are being made, the business so lost is not being secured by the Gas Department. Mr. Barber suggests that possibly the cause might be found to be due to the establishment of a much greater number of master gas-fitters in the district than formerly, these being, according to the Birmingham Directory, 75 in 1885 and 96 in 1905—an increase of 21 during the past twenty years. In conclusion, Mr. Barber says: "The following conditions apply strictly to the conduct of our business: (1) We do not advertise; (2) we do not canvass for trade; (3) we do not tender for work unless requested; (4) we charge an adequate profit (not less than you mention) on both materials and labour; and (5) we pay full standard wages for all the labour we employ."

ELECTRIC LIGHTING AT WREXHAM.

Dissatisfaction in the Town Council.

There was some plain speaking, at the meeting of the Wrexham Town Council last Tuesday, on the subject of the electric lighting of the streets. Mr. Taylor said he had had some complaints during the past few days of the arc lamps in the streets; and on the previous Sunday night one street was in total darkness. He did not know how they could remedy these things; but the general public were getting disgusted with it. Mr. Stanford remarked that the Electrical Engineer said they wanted new lamps. Alderman Samuel said one end of the town was often in total darkness, the lights in the lamps only flittering a little now and then. Mr. Sauvage said, that as a member of the Council, he was ashamed of this matter. Alderman Samuel added: The street lighting is a dead-failure. Mr. Hughes thought the time had come when they should have some report as to the financial aspect of the question. They were charged by the Electricity Department for street lighting, and they did not get what they paid for. If it had been the Gas Company, they would have expected a reduction in some of their bills. They certainly ought to have a report also as to the efficiency of the lighting. The Electricity Department was the most inefficient in the town. Alderman Jones thought too much was being made of the matter. No doubt a lamp here and there went wrong; but they should not condemn the entire system on that account. As a whole, he did not think the electric light was a failure; the private lights in houses and shops were praised by all. The arc lamps in the streets were not, it was true, always right; and he did not know why. Mr. Naylor said no one condemned the installation of the electric light, because with attention it would be all right. The Nernst lamps were out up and down the town; and he said it was due to inattention on the part of the officials. Alderman Francis said it should be brought home to the Engineer that he should excercise closer supervision. If councillors were going to be the severest critics of their own undertaking, it would only be a few years before the whole thing would be doomed. The subject then dropped.

PUSHING GAS BUSINESS AT PORT ELIZABETH.

Object-Lessons for Consumers.

We have on several occasions of late placed on record examples of the enterprise of Mr. William Arnott, the Manager of the South African Lighting Association at Port Elizabeth; and they may be supplemented by an account of his latest achievements, which has just reached us. He has had installed outside the Company's show-rooms in Main Street three lamps on the high-pressure system (35 to 40 inches), giving the light of 800 candles with a consumption of 20 cubic feet of gas per hour. The lamps are on Glover's system, and are operated by a gas-engine. When in use, there is quite a blaze of light; the whole of the street being illuminated from end to end. Mr. Arnott sends four photographs of his show window; and though they do not give any idea of the quantity of light produced, they bear ample evidence of his determination to make an attractive display. A striking feature is a placard furnishing some practical facts in regard to incandescent gas and electric lighting. He shows that an ordinary incandescent burner consuming 15 cubic feet of gas per hour, costing 1½d., an inverted burner costing 1¼d., and a No. 4 Kern burner costing 1d., give an amount of light which would cost 9d. to furnish by electricity. This is an object-lesson for the consumers which will take some beating by the Town Council, who supply the latter, but less reliable, illuminant. In the other department of the Company's business—the sale and hire of gas-stoves—equal activity is being displayed. An attractive leaflet, issued as a counterblast to a misleading one about electricity distributed by the Town Council, starts with the proposition that these appliances are a household necessity, inasmuch as they save time and money, trouble and temper; and with the view of encouraging their use, the Company have, from the commencement of the year, fixed them without charge, provided the service is not more than 100 feet from the main. As the result of the energy that is being displayed, we learn that the business in this department is very brisk, and it shows that gas is holding its own in South Africa.

Pontefract Gas Purchase Bill.—A meeting of the shareholders of the Pontefract Gas Company was held last week, under the presidency of the Chairman (Mr. Joseph Taylor), for the purpose of considering the proposed purchase of the undertaking by the Corporation. After a lengthy discussion, it was decided to oppose the Bill which the Corporation are promoting; and the Board were empowered to take such steps for this purpose as they might consider necessary.

Epsom District Council and the Gas Company's Bill.—At the meeting of the Epsom District Council last Wednesday, the Chairman (Mr. F. W. Ledger) reported that a Sub-Committee had conferred with the Directors of the Gas Company with reference to their Bill, and the Company had met the Council in what they desired. The only point outstanding was the question of illuminating power. Under the old Act it was 14 candles; but under the Bill the Company wished to reduce it to 13 candles. The Company were willing to meet the Council in having the old standard; but it was a question for the Council to decide whether they ought to insist on 15 or 16 candle power. It was agreed that the Council would be satisfied if the Company would insert in the new Bill the old standard.

THE ACCIDENT FUND OF THE SOUTH METROPOLITAN GAS COMPANY.

A Review of the Fund by Sir George Livesey.

The "South Metropolitan Gas Company's Co-Partnership Journal" for the current month contains a review, by the Chairman of the Company, of the accident fund. It has been reprinted in a separate form, prefaced by a note by the author giving a few explanatory particulars in regard to the fund. It was started in 1891, and revised in 1897; and after the passing of the Workmen's Compensation Act, it was registered in 1898 as a "contracting out" scheme under the Act. The subscriptions of the workmen and of the Company are given in the review. The benefits are accident pay at the rate of 12s. a week for all accidents that incapacitate for not less than three days nor more than a fortnight, and 18s. a week for all that disable for a period extending beyond a fortnight. In fatal accidents, the widow receives a weekly allowance not exceeding 20s. nor less than 10s, according to the circumstances of the family. A jury of twelve workmen sits and gives a verdict upon every accident. The scheme was adopted in 1898 by practically all the men; and on its renewal in 1903, there was absolute unanimity—not a question being asked nor an objection raised. The following is Sir George Livesey's review of the fund.

There are no circumstances in industrial life more distressing than a serious accident, which in a moment strikes the strong and healthy man, and, it may be, deprives him of life and those dependent on him of their protector and breadwinner; or, even if not fatal, may cripple him for life, or for a time and render him less able to earn a living. If he recovers entirely, much suffering may be his lot before health and strength are restored. Happily, by far the greater number of accidents are not serious, and only incapacitate for a short time; but often a slight accident might have been serious, and many would have had serious results, but for the valuable and noble work done by our Ambulance Corps in giving first aid. We all thank them heartily.

It is the duty of every man to use all possible foresight and precaution to prevent accidents; and this is the chief object of our scheme, which might be called the Prevention of Accidents Fund. Its other important object is to provide a certain and sure allowance during incapacity, and for dependants in fatal cases.

It is with much regret that I have to report one fatal accident in the past year—the death of Robert Percy, which was the subject of an article in the November "Journal."* There were very few others of a serious nature; but while expressing the sympathy which we all feel for those sufferers, we may congratulate ourselves on the fact that complete recoveries have been made in almost all cases.

There is cause for congratulation in the fact that, although the number of men employed constantly increases, the number of accidents diminishes. In the first year of our fund—viz., 1898—there were 4325 subscribers and 299 accidents, or 6·9 (nearly 7) per cent. In the last year, 1905, there were 6051 subscribers and only 243 accidents, or 4 per cent. This includes every accident that disables for not less than three days. This is extremely satisfactory, and reflects great credit on all concerned—engineers, foremen, and workmen. It is evidence that our co-partnership extends to the prevention of accidents, and that all are working earnestly together for that good object. The yearly results and progress have been as follows:—

Year.	Number of Men.	Number of Accidents.		
		Total.	Per Cent.	Per 1000.
1898	4325	299	6·91	69
1899	4463	297	6·66	66
1900	5037	318	6·31	63
1901	5767	315	5·46	54
1902	5544	259	4·60	46
1903	5901	286	4·84	48
1904	5986	267	4·46	44
1905	6051	243	4·01	40

I have added the last column to make the figures more clear—it means that 69 in every thousand subscribers to the fund, or men employed, including winter and cdd men, had an accident in 1898, and that every succeeding year there was a reduction except in 1903, when there was a slight rise, until in 1905 there were only 40 accidents per 1000 men. Of the 243 accidents, one was fatal, 123 disabled for more than a fortnight, and 119 for not less than three days and not over a fortnight.

The yearly improvement, with the slight exception of 1903, is very satisfactory. Had the rate per cent. remained the same as in 1898 all through the eight years, instead of 243 accidents last year, there would have been 418, or 175 more than actually happened. The prevention of 175 accidents in a year is a great thing, and forcibly shows the advantage of men using their brains in their daily work. Thus has our so-called "contracting out" of the Workmen's Compensation Act largely reduced accidents; while the Company's workmen have "*contracted in*" to more liberal and better compensation than the Workmen's Compensation Act provides. I am glad to hear from officers and workmen continued testimony as to the advantages of our inquiries by a jury of twelve workmen into every accident. This has, perhaps, done more than anything else to induce care in the avoidance of accidents, by making men think.

About three months ago, I had the gratification to hear that the workmen of the Gas Department of the Corporation of Birmingham had petitioned the Gas Committee to introduce our jury system in their extensive works. The Chief Engineer, Mr. Hack, applied to me for information. I sent in reply reports from all our Engineers and from Mr. Shoubridge, of the South Suburban Gas Company, all speaking warmly in favour of the juries, which satisfied Mr. Hack that they could be advantageously introduced at Birmingham. Why not in other places? The jury system was started in 1892, the South Suburban followed in 1901, and now Birmingham. But others have not realized the advantages, and therefore we three stand alone.

To prevent accidents is to save much suffering and loss to individuals; and prevention of accidents must also save employers from loss. In the first place, there is the compensation which they would have to pay; and accidents to workmen caused by carelessness and want of thought, besides injuring the man, often damage plant and machinery, which losses the employer must bear. It is therefore to his interest to work with his men in avoiding accidents. I am not sure whether the Workmen's Compensation Act, where both parties do their best, may not be to the pecuniary advantage even of the employer, if it is worked with the object of preventing accidents.

It is often said that the Act works badly for men getting on in years—that employers object to old men on the ground that they are more liable to accidents. I believe this is a mistake; and, with the assistance of the Company's workmen, I think it can be proved. We know, or can ascertain, the ages of the men who have had accidents. What I want to know is the age of every man employed by the Company. I shall then be able to calculate the liability to injury of men of all ages, which, in the interest of old men who are being deprived of employment (not here, I am glad to say), I intend to make public.

It may be thought that we have an excessive number of accidents. In the first place, it must be remembered that every accident, even the most trivial, that incapacitates for three days is compensated. We therefore include many that were previously unnoticed. We have compared our own figures from year to year; but how do we stand in comparison with other trades? Are we higher than we ought to be? The last report of the Chief Registrar of Friendly Societies for the twelve months ended in June, 1904, gives particulars of all the certificated accident funds divided into four groups as follows:—

Trade.	Number of Men.	Number of Accidents.		
		Total.	Per Cent.	Per 1000.
2 railways	40,940	4,080	9·96	99
22 factories	21,442	1,654	7·70	77
28 mines	54,000	11,425	21·16	211
2 quarries	1,237	310	25·00	250
54 Total	117,619	17,469	Average 14·85	Average 148

Gas companies are not comparable with railways, mines, or quarries, but they come into the group of factories. I therefore give the rate per 1000 for all the factories in which the nature of the work is named, and two others, which have a very low rate, marked thus (*)—one apparently a City warehouse, and the other is simply described as a "Workpeople's Compensation Scheme," with no information about the business or trade. The numbers of men employed range from several thousands to less than fifty in the various trades:—

Trade.	Rate of Accidents per 1000 Men.	Trade.	Rate of Accidents per 1000 Men.
Glass-works	72	Works at Engineers, &c.	103
Crucible-works	82	Staffordshire Forge	142
Gas-Works—		Workpeople's Compensation	
South Metropolitan	48	Scheme, Staffordshire*	26
South Suburban	43	Portland cement works	124
Vestry employees	72	" " "	169
Local board employees	131	Salt-works	163
Importers of silk, &c., City firm*	35	Alkali-works	96
Works at Newcastle-on Tyne	84	South Wales Friendly Society	123

Excepting the two above mentioned, the two Gas Companies have had fewer accidents than any of the others; but that is no reason for relaxing our efforts to make them less. What has been done in that direction is an encouragement to all of us to try to do more; and it must always be remembered that it is very easy to fall back from a high standard. The Directors rely on the active assistance of all co-partners to try to improve on the standard of last year.

There remains the interesting question, What is the cost? The original subscription of 2d. per month per man and double that amount by the Company—6d. per month in all—or 6s. per man per annum, was not quite sufficient at first, and the deficiency was made up by the Company; but it is now more than sufficient, for last year there was a gain of £319.

The total joint subscriptions were		£1735
Payments for accidents	£850	
Do., for widows of men who lost their lives in the last eight years	366	
Do., for widows of men who lost their lives before the fund started	200	
		1416
Surplus on the year		£319

This surplus, added to £157 previously in hand, will be carried forward. As others may see this statement, I give the following information: We paid in wages last year about £480,000. The total subscriptions to the fund of the men and the Company amounted to £1735, or 7s. 3d. per cent. on the wages. The cost of accidents in the year, excluding the £200 paid to the widows dating before the fund started, was £1216, or 5s. per cent. on the wages, and including the £200 it comes to 5s. 10d. per cent. This is much less than any insurance company would charge under the Workmen's Compensation Act; and we have the satisfaction of knowing that the benefits derived by the workmen are very much greater than they would have got under the Act.

* See "JOURNAL," Vol. XCII., p. 402.

Discounts to Large Gas Consumers at Tipton.—The Gas Committee of the Tipton Urban District Council have resolved that a discount shall be allowed to large gas consumers, at the discretion of the Engineer (Mr. S. O. Stephenson).

INCANDESCENT LIGHTING IN EDINBURGH:

ITS INTRODUCTION, EXTENSION, AND RESULTS, WITH REJOINDER TO STRICTURES OF MR. JOHN F. SIMMANCE, OF LONDON.

By Geo. A. D. Mackay, Inspector of Lighting.

[Just before going to press last week, we received from Mr. G. A. D. Mackay, the Inspector of Lighting at Edinburgh, a copy of the following document addressed to the Convener and Members of the Lighting and Cleaning Committee; and in view of the prominence accorded, in the "Journal" for Dec. 19, to Mr. Simmance's report on the public lighting of the city, we hastened to place before our readers Mr. Mackay's reply. Unfortunately, however, in the rush of getting it in type, the printers transposed some of the paragraphs; and the mistake was not noticed until too late to rectify it. The sequence of this portion of the report was thus, of course, entirely destroyed; and under these circumstances, we have considered it only fair to Mr. Mackay to reprint the entire document in the current issue.]

The first experiment in incandescent lighting was carried out in 1895, when an installation of nine lanterns was set up in Nicolson Square. After a trial covering seventeen weeks, the Inspector submitted a report which was not quite favourable to the new light. He, however, emphasized the fact that the period over which the experiment extended was too short to warrant definite conclusions, and suggested suspension of judgment. Some time thereafter a few incandescent lamps were placed in several parts of the city. But the question of their general introduction was not seriously entertained until 1903, in which year a large extension took place, and another is now in progress.

Since the date of the experiment referred to, the general equipment of the incandescent light has undergone a great improvement. The lanterns are of a superior type; are sufficiently wind-tight; are better ventilated; and altogether more suitable for the purpose than those used in the experimental stage—with the further advantage that there is an increase in the durable nature of the mantles.

In order to check the shaking of the lamps, and lessen oscillation on the part of the mantles, anti-vibrators have been introduced into streets with heavy traffic, and also into others where likely to be effective. The ordinary lamp-post is being superseded by the root pillar, which is less liable to swaying; and the general result is a greater steadiness of the lanterns, with a corresponding increase in the life of the mantles.

At the present time the lighting world is exceedingly active in quest of further improvements; and in Edinburgh nothing of a promising nature in this direction is being lost sight of. A good deal is claimed for the inverted burner lately put upon the market; and the Inspector is taking practical measures to test its qualities. This burner is simply (as its name suggests) the ordinary incandescent burner turned upside down. The light coming from below instead of from above concentrates in a direct manner the illumination exactly where it is required; and it is claimed that with a 2½-feet burner the light is equal to that of a 3-feet, and, further, that it adds to the durability of the mantle, as there is a lessening of vibration. The lessened vibration is accounted for by the fact that the inverted mantle is fixed on a porcelain ring, whereas the other is suspended from an upright rod—leaving it very liable to swaying by even light currents. The inverted burner is under experiment, the result of which is awaited with considerable interest. Twelve of these were in operation at the end of the year, the number of which is about to be increased to forty-eight.

The number of incandescent lamps in use on Dec. 31, 1905, was—

Lamps.		Adjusted to Burn.
348	2	cubic feet per hour.
12	2½	,, ,,
3742	3	,, ,,
50	4	,, ,,
Total 4152		

At the date referred to, the total number of lamps throughout the city was 10,140; the percentage of incandescents being 40·94. By the end of the current financial year, the incandescent lamps will number about 4714, or 46 per cent. of the whole.

Apart from cable-car routes, which are lighted with electricity, there are numerous streets with heavy traffic which require to be well lighted; and this is secured by the 3-feet incandescent burner. For side streets, however, with a comparative absence of high tenements, and for residential parts of the city where there are open spaces, lighting with a 2-feet burner gives satisfactory results. Angles and crossings, however, in connection with such streets, require more attention, and such places are lighted with the 3-feet burner.

A serious item in the expenditure on incandescent lamps is the mantle; and it is important to ascertain exactly the amount of wastage under this head. With this view, a careful record is being kept of the mantles used. Taking the twelve months ending Dec. 31, 1905, the consumption of mantles to each lamp was 9·03.

The superiority of the incandescent burner over the flat flame is too apparent to require commendation. The cost, however, is a great deal more. Each incandescent lamp involves an annual expenditure of about 41s.; while that of the ordinary globe is 32s., or 9s. less.

In his first report on incandescent lighting, the Inspector indicated that, in the event of this light becoming general, an addition to the lamplighting staff would be required. He has been slow to make any considerable request in this direction, remembering that the lighting of the city is in a state of transition. But with an installation of over 4000 lamps now in operation, and the number of which is being gradually increased, the request for additional assistance cannot any longer be delayed. At present the lamplighting staff numbers 92 men. The lamplighter has to clean, light, and extinguish, and to report any lamp defects on his beat every morning. In addition to this, he has to extinguish a certain number of lights in common stairs. Two men are, besides, employed in fixing and renewing mantles; and two in the conversion of ordinary gas-lamps into incandescents. There are two overseers engaged in the work of supervision; but with the growth of the city and the greater attention required for incandescents, their hands are full.

The work of adjusting the incandescent lamps is too delicate and intricate for the average lamplighter, requiring, for the successful manipulation of burners and mantles, practical men such as gas-fitters or plumbers. The responsibility for 1000 lamps would be a fair charge for each man. At present the duty of attending to the burners and mantles of 4000 lamps, the number of which is increasing, devolves upon two men; and it is too much—especially when it is remembered that the lamps are distributed all over the city, with its extensive area. By the end of the financial year, the incandescents will number close on 5000. In the meantime, two men for burners and mantles are urgently needed.

The Inspector takes the liberty of pointing out that there are difficulties in the way of carrying out the proposal that the whole of the ordinary gas-lamps should be superseded by incandescents within a period of two years. This would result in an immense number of globes being thrown aside, and would lead to considerable loss, as they are not to any extent a realizable commodity. If, however, the conversion went on at the rate of 2000 lamps per annum, many of the globes could be used to replace breakages, and a more favourable opportunity would be offered to dispose of the rest to the best advantage.

Lists of streets for next year's conversion will shortly be submitted, and an early decision is desirable, in order that advantage of the long summer days may be taken in carrying out the work. It were also well that, in view of the coming estimates, the respective numbers of the 2 and 3 feet burners were early and definitely fixed upon. The public rate per 1000 cubic feet for incandescents is 2s., for ordinary flat-flame lamps 2s. 5d., whereas for private consumption it is 2s. 9d.

Taking into account the varying requirements of the streets still to be overtaken with incandescent lighting, the Inspector, after careful consideration, is of opinion that, if the lighting is to be satisfactory, the situation on completion of the conversions would require to approximate the following:—

Lamps.	Consumption.
4,500	3 cubic feet.
500	2½ ,,
5,800	2 ,,
Total 10,800	

In view of the great expenditure on gas, its price is of vital importance. Permanent fixity of charge is, of course, impossible; gas being, like other commodities, subject to variation in its cost of production. It is, however, very desirable that the current ratio of price to that of private consumption should be maintained. The public charge for incandescent gas is eight-elevenths of the rate for private consumption. It would be satisfactory to have a guarantee for the continuance of this arrangement.

The wisdom of not rushing the incandescents is to-day more than evident. The price of the lantern has fallen by about a half; and this, with a smaller consumption of gas than was at one time proposed, makes the general all-over cost some 50 per cent. less than it otherwise would be.

The incandescent lamps—giving a better illumination than the ordinary flat flame—admit of wider spacing; and in view of this light becoming general, such arrangement will in future be carried out in cases where new lamps are required. This will result in a lessened proportion of lamps to locality, and be in the interest of economy.

The Answer of the Lighting Department to Mr. Simmance.

Owing to a lack of natural sequence and precision of statement in the reporter's mode of expression, it is not in all cases quite easy to gather his real meaning. This holds true of his remarks on the condition of the incandescent lamps.

It is frankly admitted that a first reading of his observations on these is fitted to leave the impression that he is bringing a serious indictment against their management. This impression, however, is largely corrected by a further and more careful perusal, in which it is seen that his opinions are to be reached only by carefully construing his statements as a whole, and avoiding undue prominence to isolated passages.

In order to make this clear, the following extracts from the report are submitted in parallel columns—the one set expressing disapproval and the other approval.

Disapproval.	*Approval.*
"They (the incandescent lamps) are a great improvement naturally on the old flat flames; but in most cases nothing but disapproval can be expressed of them as specimens of incandescent lighting."	"In every street where incandescent gas is used, the roads are admirably lighted, even with the lanterns in their imperfect condition."
"I state definitely that at least 40 per cent. of the gas expended on the lamps is wasted."	"In fact, if the consumption of gas of each were reduced to 2 feet, and the mantles and lanterns properly maintained, the light would still be excellent, as good in most cases as at present."
"I must state that in any district in London where the maintenance is in the hands of a private contractor, the Local Authorities would not for a single week tolerate the condition of things with regard to incandescent gas-lamps which prevails in Edinburgh."	

The disapproval extracts say: That the majority of the lamps is not sufficiently maintained; that 40 per cent. of the gas is wasted; and that such condition of things is intolerable. But strange to say it is asserted in the same breath that every street in Edinburgh which has incandescent gas is admirably lighted; and the lighting so satisfactory that it may be regarded as a standard for street illumination. To put it mildly, the statements seem contradictory, and hardly reconcilable. The allegation is that, owing to insufficient maintenance, only a little more than one-half of the regulation quantity of gas is utilized for illumination; and yet, despite this, the lighting results are so excellent as to

leave nothing to be desired. Everything is comparative, and doubtless with increased expenditure an improvement in maintenance might be effected. The present maintenance, however, can hardly be described as intolerable, in view of the reporter's admission that the streets are admirably lighted.

It is possible, owing to causes preventable and unpreventable, that the entire quantity of gas paid for is not represented in the illuminating strength of the lamps. But before assuming the existence of waste, which is really indeterminate and purely speculative, it were well to ascertain definitely whether the regulation amount of gas is being received. On this point, however, there is no light to be had from the report of Mr. Simmance; and, to say the least, it is surely unfortunate that on a matter of such vital importance the expert should be silent and the Corporation left in the dark. That is to say, they know what amount of gas is paid for, but are at sea as to whether it is got.

One thing, however, is clear—that, on account of the varying pressures throughout the City, the maximum of illuminating efficiency is not continuously obtained. The expert states that the minimum pressure is 2 inches and the maximum 4¼ inches. The variations obtain not only in different districts, but even in these districts during different hours—making it impossible to have a steady and unbroken maximum of efficiency in all parts of the city. So long as the pressure does not fall below 15-10ths the light is not unsatisfactory. But does it never fall under this figure?

On Dec. 15 last, Mr. Herring, in a communication to the Lighting Department, says: "You may take it from me that it would be a most unlikely thing for the pressure to be less or even as low as 15-10ths in any of our public lighting districts." In, however, a letter dated Jan. 12, 1906, he says: "It is quite possible for the pressure to drop below 13-10ths or 14-10ths in some places." The pressure of gas as supplied to the public lamps should be periodically tested—say, once a month, during the winter season—to enable the governors to be regulated to suit the varying conditions.

The question of maintenance, though doubtless of first importance, has to be looked at from a practical standpoint. Regular cleaning, timely attention to mantles and burners, and upkeep of the lantern in a state of efficiency are the objects aimed at. The mantle, however, is the *crux* of the incandescent lamp. Hitherto the department has endeavoured to exercise economy in that direction—renewing at once all mantles incapable of continuing a fair light, and retaining for a little longer those in only the initial stage of fraying or weakening. In the foregoing section of this report, the Inspector has touched on the question of maintenance, calling attention to the increasing number of incandescent lamps under his charge, the very large area over which they are distributed, and the consequent necessity of strengthening the lighting staff. He is anxious to make the maintenance as effective as possible; and if the Corporation see fit to authorize a more generous use of mantles, he will gladly give effect to their wishes.

Apart from subsidiary strictures, which are dealt with later on, the salient points raised by Mr. Simmance in connection with the incandescent lamps are two in number. The first is to overcome by improved maintenance the alleged waste of gas; and the second to displace the 3-feet burner by making the 2-feet one general over the city.

The answer to the first is that the maintenance which he desiderates would involve additional expenditure; that such expenditure might even exceed the value of the alleged unutilized gas; and, further, that, in view of his admission that the streets are admirably lighted, the extra gas is not required. In short, the expenditure on maintenance might be carried to such an extent as to make incandescent gas as costly as electricity.

The answer to the second is, as already indicated, that the 2-feet burner is suitable for side streets or others with an absence of heavy traffic, and also for residential quarters of the city with open spaces; but for busy and important thoroughfares not electrically lighted, the 3-feet burner is a necessity.

It has to be remembered that the incandescent lamp, while a great improvement on what it is displacing, has not the reliability of the electric light, which remains undisturbed by storm and frost. Under a severe frost, a proportion of the gas-lamps is liable to darkening; and the wind, which so frequently asserts itself in Edinburgh, has a specially injurious effect on incandescents. In view of these interruptions to continuous illumination, some allowance (with even the most approved maintenance) must be made for occasional failure. In consideration of these weaknesses incident to gas-lamps, the suggestion of Mr. Simmance, to make the 2-feet burner general, cannot be recommended. In no town throughout the country has the 2-feet burner been adopted for general use.

The following are the subordinate criticisms directed against the management of the incandescent lamps: At p. 16 of the expert's report objection is taken to the manner in which the lamps are fixed, but no information is given as to what is considered wrong. The Inspector is quite at a loss as to what is meant. It appears, however, from a remark on p. 17, that the charge of improper fixing is made against the German globe lamps, all of which were put up by the staff of the Gas Commissioners. Of the incandescent lanterns in use at the time of the reporter's visit, quite a number had also been fixed by Mr. Herring's men. The aperture in the bottom of the lantern is condemned as being too large, and admitting a current of air injurious to the mantle. It is not clear whether this refers to the square lanterns or the German globes. By a process, however, of putting two and two together, it becomes evident that the German globe is meant. This lamp, when introduced, had too little air, and sweating followed. This, however, was largely remedied by a device of Mr. Herring's, whose staff had fitted up these lamps. A weakness, however, remained, in the liability of the glass bottoms to be blown up in windy weather; but when this occurs it is at once reported and made good. The aperture in the square lantern, which measures ⅜ in. by ½ in., and not 1 inch in diameter, as suggested by the expert, left little to be desired; but the suggestion that a washer should be put round the supply pipe, though not considered appreciably necessary, has been given effect to.

At p. 17, the following is to be found: "In many cases the glass bottoms are wholly absent; in still more partially gone." This is a general charge, whereas it ought to have been strictly limited to the German globe lamps. In not a single instance has a bottom in the square lantern been blown up.

In the middle of July, when Mr. Simmance was in Edinburgh, the following were the number and description of the incandescent lamps in operation: 2327 square lanterns, 270 German globes, 43 cylindrical. Taking these 2327 square lanterns from the time of erection to the foregoing date, only four halves of the glass bottoms came to grief; and this was due to collision with the lamplighter's torch.

The reporter's finding on the stair lights, while very favourable, yet calls for remark. The testing has been on too limited a scale to warrant a general inference—only 14 jets out of a total of 11,424 having been dealt with. Further, the governors are said to be adjusted to pass from 1½ to 2 cubic feet of gas per hour, whereas they are restricted to 1½ cubic feet.

In concluding his reply to Mr. Simmance, the Inspector is disposed to ask: Why were the candle values determined by a standard No. 7 batswing, and by an argand burner consuming from 3 to 3½ feet of gas per hour, instead of by the union-jet burner prescribed by the Edinburgh Gas Act?

METROPOLITAN WATER BOARD.

An Unexpected Gift.—The Honor Oak Reservoir.

The Board met last Friday for the first time after the Christmas recess—Sir R. M. BEACHCROFT in the chair.

The first business was the reading by the Chairman of a letter he had received from Sir Edward Fry, one of the Arbitrators under the Metropolis Water Act, 1902, in which was enclosed a cheque for £3081 10s. 4d., which he asked the Board to accept. Sir Edward explained that for his services between October, 1903, and October, 1904, his remuneration was £5000. He, however, did not desire to retain more for his personal use than £1500, which was the difference between his pension of £3500 and the salary he had received as a Lord Justice of Appeal (£5000). He added that he had deducted the income-tax he had paid, and a sum of £250 which he had presented to the Institution of Mechanical Engineers, in recognition of their courtesy while the Arbitrators were sitting in their building. This left a balance of £3081 10s. 4d., for which the cheque was drawn. It was unanimously agreed that Sir Edward Fry should be informed that the Board accepted his generous offer, and tendered him their cordial thanks.

The Works and Stores Committee reported that at the meeting on the 4th of August last the Board approved the course taken by the Committee in inviting tenders for the completion of the construction of a covered reservoir at Honor Oak, and in accepting the tender of Messrs. J. Moran and Son, of Westminster, at the sum of £136,561 for the work, subject to the sanction of the Local Government Board to the necessary loan. Application for such sanction was made, and a letter had been received from the Local Government Board stating, in effect, that the Water Board did not appear to have power to construct the reservoir, and that it was therefore impracticable to sanction the loan. Under these circumstances, a position of exceptional difficulty had arisen; for, while the statutory powers had expired, the need for completing the reservoir was pressing. It was consequently highly desirable that the Board should, as quickly as possible, seek power to complete the scheme; and the Committee were advised by the Clerk of the Board, after consultation with the Parliamentary Agents and the Local Government Board, that the best means of procedure would be to petition for leave to introduce a late Bill, or, in the alternative, to add provisions to the Board's Lea Valley Bill. Whichever course was adopted, several months must elapse before the formal sanction was granted; and if in the meantime work were suspended, it would mean practically a delay of nearly a year in the construction of the reservoir. The work was one of those put forward last year as urgently required in order to cope with the continually increasing demand for water, and provision was made for it in the annual estimates; and as it was one which was needed in order to safeguard the public interest, the Committee considered that the Board should rely on Parliament rectifying the error of the Southwark and Vauxhall Water Company in allowing their statutory powers to run out, and take upon themselves the responsibility of authorizing the work to be proceeded with in anticipation of the necessary authority being granted. The Committee recommended accordingly; and the course suggested was adopted.

In the report presented by the Finance Committee, they reminded the Board that on Dec. 9, 1904, they reported the receipt of a number of letters from Local Authorities urging upon the Board the desirability of having their water-rates levied by precept upon such authorities, and collected together with the local rates. Under section 15 (7) of the Metropolis Water Act, 1902, it is provided that, within three years after the appointed day, the Water Board may prepare and publish in the "London Gazette" a scheme enabling their charges for the supply of water to be collected together with any local rate. The Committee said they had since had an opportunity of going carefully into the question, and having received a report from the Comptroller dealing with it at some length, they thought it desirable that members of the Board should have an opportunity of studying the report. They had accordingly given instructions for a copy to be circulated. They concurred in the opinion of the Comptroller that it would be unwise for the Board at the present time to put forward any scheme providing for their charges being collected together with the local rates; and accordingly they did not make any recommendation on the subject.

Returns relating to the supply of water for the months of November and December last were presented. In November the total of the average daily supplies in each district was 209,068,000 gallons. The number of houses, &c., supplied amounted to 1,038,753, and the total estimated population was 6,764,427. The mean supply per head per day was 30·4 gallons, against 31·8 gallons in November, 1904. The total quantity of water in store in impounding reservoirs at the end of the month was 5680 million gallons. The number of additional supplies laid

on was 1373, while 10,272 yards of new mains were laid. The mean rainfall was 2·87 inches. Of fires, there were 201; the New River district heading the list with 77, and the Southwark and Vauxhall district following with 50. For December, the total of the average daily supplies was 201,829,000 gallons; the number of houses supplied being 1,039,867, and the total estimated population 6,770,304. The mean supply per head per day was 29·9 gallons; the figure for the corresponding month of 1904 being 31·4 gallons. The quantity of water in store at the end of the month was 6150 million gallons. Of new supplies there were 1124, and 6965 yards of new mains were laid. The mean rainfall was 0·66 inch. Of the 274 fires which occurred, 91 were in the New River district; the Southwark and Vauxhall district following with 68, and the West Middlesex with 55.

OSSETT WATER BILL TO BE ABANDONED.

Among the Bills for the forthcoming session of Parliament of which notice was given last November, was one to be promoted by the Corporation of Ossett, to confirm an agreement entered into between them and the Halifax Corporation for the purchase of a supply of water at the rate of 5d. per 1000 gallons for a period of twenty years. The present supply is obtained from the Dewsbury and Heckmondwike Water Board, at 6d. per 1000 gallons; and the agreement will expire in 1907. Negotiations with that body for a renewal had failed; the Corporation neglecting to avail themselves within the stipulated time of an offer to renew, and the Board afterwards demanding a higher price. The Corporation thereupon came to an agreement with the Halifax Corporation, and gave notice of a Bill to authorize the laying of mains from Brighouse to Staincliffe, at an estimated cost of £13,000. It was argued that, while more expensive for a few years (until the costs of the Act has been paid), the arrangement would effect a considerable saving eventually. Their contention, however, was strongly contested by the ratepayers, though it was recognized that it would afford increased pressure to the higher parts of the borough, which in the past have been badly served with water, even for domestic purposes. When the ratepayers were called together to consider the scheme, the meeting was adjourned for a week, with a view to negotiations with the Dewsbury and Heckmondwike Board, who, it was stated, were prepared to continue the supply at an increased price of 6½d. per 1000 gallons. In the meantime, that body wrote offering a thirty years' supply at 6½d., with increased pressure. After again consulting the ratepayers, the Corporation had an interview with the Board; and the latter amended their offer to 6d. per 1000 gallons up to 3 million gallons per week, and 6½d. over that quantity—the present consumption being slightly over 2 million gallons weekly. These terms were laid before the ratepayers last Wednesday week; and though it was stated that the Corporation had already expended £500 in the promotion of the Bill, the Dewsbury and Heckmondwike Water Board's offer was accepted, and the Bill abandoned. This decision was arrived at by an almost unanimous vote; the opinion being freely expressed that the Corporation had made a good bargain.

When the Halifax Water Committee met last Tuesday, a letter was read from the Town Clerk of Ossett informing them of the decision come to by the ratepayers to take a supply of water from the Dewsbury and Heckmondwike Water Board, rather than from Halifax, as had been previously agreed upon. The Ossett Town Council had, the letter stated, held to the Halifax arrangements until their position was untenable, and they had to accept the inevitable. They were sorry for the trouble and expense caused to the Halifax Corporation, and appreciated the courtesy shown by the Water Committee during the whole of the negotiations. The announcement contained in the letter was accepted by the Halifax Water Committee with regret; but the withdrawal of Ossett does not materially affect the scheme, as a new water-main from Halifax to Brighouse is necessary to meet the present demands on the proposed route of the main, as well as to supply Morley with water.

UTTOXETER WATER SUPPLY.

Mr. W. O. E. Meade-King has held, on behalf of the Local Government Board, an inquiry at Uttoxeter into the relative claims of two schemes for augmenting the water supply of the town. It was explained that the district had laboured under a shortage of water for many years; and the Urban District Council had been trying to increase the supply, with which object a number of schemes had been under consideration. The two which were regarded as the most feasible ones were submitted to the Inspector. The first was a scheme to acquire the springs at Quickshill, which would provide an excellent supply of pure water by gravitation. An agreement had been entered into between the Council and Lord Edward Talbot for the purchase of the springs for £500, and the land at £100 per acre. The Council's Engineer (Mr. Wilcox) furnished particulars of this proposal. He said the springs were about 6 miles from Uttoxeter, and were capable of producing 285,000 gallons per day. It was proposed to pump into a reservoir which would allow the water to reach the highest portions of the town by gravitation. The outlay would be £13,000, with an annual cost of £150. The supply would be ample, and the quality excellent. The water would be pumped by turbines worked by the water of the River Churnet, which ran close to the springs. The second scheme related to a borehole, the cost of which would be £7000, with an annual expenditure of £538. The amount to be raised was 100,000 gallons per day, which would take a 30-horse power engine twelve hours to complete. It was contended that by using suction gas a saving of £58 per annum would be effected. The Inspector wished to know which scheme the Council approved. It was, however, stated that they declined to recommend either—preferring to leave the decision to the Local Government Board. It was suggested that a poll of the inhabitants should be taken.

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NEW YORK WATER SUPPLY.

Completion of the New Croton Dam.

Reference has been made from time to time in the "JOURNAL" to the works in progress for affording an additional supply of water to New York. The most important feature of these works is the new Croton dam, which was commenced more than thirteen years ago, and when completed will have cost about £1,600,000, exclusive of the land, but inclusive of some 15 miles of highways, several bridges, and some changes involved for the old Croton aqueduct. This makes the construction of the dam itself total up to something like £1,500,000, of which more than £200,000 is due to the change from earth to masonry in the south end section. As the work on the dam is now rapidly drawing to a close, the following particulars in regard to it, taken from a recent number of "Engineering Record," may be of interest.

The dam is exactly 300 feet high from the lowest point in the foundations to the crest; and it is thus the tallest dam in the world. It forms a reservoir 18 miles long, and impounds about 32,000 million gallons of water. It is built of solid granite ashlar and rubble, except the south extension, which is backed with cyclopean concrete; and it has a spillway 1000 feet long at right angles to the axis of the dam, and 16 feet below its crest, and contains altogether about 855,000 yards of masonry. The spillway is crossed by a steel arched bridge of 200 feet span, which has been designed and painted to harmonize as closely as possible with the granite masonry—an attempt which has been notably successful as far as colour and the continuity effect of the dam cornice is concerned, but which emphasizes the comparative slenderness of the arch rib in relation to the massive buttress formed by the dam at one end and by the hillside at the other. The contract for the construction of the dam was awarded in August, 1892, and since then there has always been employed a large force, sometimes amounting to nearly 1000 men, at the dam and quarries. A very large mechanical plant, with over 700-horse power of steam-boilers, has been put up; important auxiliary works have been executed; two large quarries have been opened, and many interesting operations have been conducted. A large power plant was permanently installed a short distance below the dam site. The river, which had a flood flow of 15,000 cubic feet per second, was diverted by means of a canal 200 feet wide and 1000 feet long in rock cut with a crescent-shaped wing dam at each end built of earth, stone, piles, and cribwork. The upper dam was 30 feet high, and joined a masonry wall 23 feet high and 630 feet long. These barriers excluded the water from a pit excavated 150 feet below the old river bed, and drained by a battery of seven steam-pumps which raised the water from the deepest part in two lifts, and sometimes handled as much as 10 million gallons in 24 hours. Earth was excavated by hand and by steam shovels, and was removed to the adjacent spoil banks by teams, by locomotives, by an inclined plane and hoisting-engine serving depths of over 70 feet, and finally by three cableways about 2000 feet long, parallel with the axis of the dam, and nearly 300 feet above the lowest excavation. The masonry was laid by the aid of the cableways and about 30 large stiff-leg steam derricks, which were carried up on the top of the masonry as it progressed.

The south end of the dam was originally designed and partly constructed with earth embankment and a core wall. It was finally determined to change it to solid masonry; and as the foundations which had been suitable for the original structure were considered inadequate for the greater weight of the stonework, the excavation was carried down much deeper, and passed through a very interesting deposit of disintegrated rock which existed at a considerable depth below the surface. A large plant was erected for crushing stone, screening sand, and mixing concrete, and work was carried on during cold weather with special provisions against freezing concrete and mortar.

The completion of the dam was much delayed by the change in its design; and when a water famine threatened the city of New York, great efforts were made by the Engineer and Contractor to render it available for storage purposes before it was wholly finished. To expedite the work, steel towers were erected to carry the derricks in advantageous positions, and were permanently built into the masonry as the latter rose above and around them. When the dam masonry was considered to be above any probable flood, but before it had reached in some places to within many feet of its final height, the arched opening in the base through which the river had been flowing was rapidly closed behind the protection of a low coffer-dam which enabled the masonry filling to be built so as to form its own protection, and be safely completed from the up-stream to the down-stream face of the dam. After this was accomplished, about 1000 million gallons of water, sufficient for 30 days' supply for the city of New York, was stored and used during last summer—augmenting the reserve supply which, at best very low, would have been dangerously so without this provision.

The face of the dam is built with granite ashlar, in courses from 20 to 30 inches in depth, with dressed arrises and joints of a maximum thickness of 30 inches made with 1 to 1 cement mortar. The rubble backing was laid with the utmost care and rigid inspection. The large stones were set on beds of concrete and mortar, in which they were fitted by bedding and lifting them again with derricks from three to six times—never less than twice, and usually three or four times; great care being taken to fill in plenty of mortar over all irregularities, so that the stone had perfect contact throughout, and floated easily. Spaces between the large stones were filled with smaller stones carefully bedded in mortar so that no two touched each other. The 85,000 cubic yards of concrete backing in the dam extension contains large stones which were quickly lowered into thick beds of fresh concrete, and were then shaken with bars until they were deeply bedded and floated easily in the soft mass. Special care was taken to set all stones with convex faces down, and never to allow any stone to have a cavity in the lower surface in which air might be confined. As the thickness of the dam at the bottom of the reservoir is from 125 to 216 feet, it is not likely that there can be any passage of water through it; but there is seepage, which is of interest as showing the great difficulty or even

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Saltley, Birmingham (Second Contract)	2,000,000	Winnipeg, Man.	500,000	Rochester (Second Contract)	500,000
Windsor St., Birmingham (Second Contract)	2,000,000	Colchester (Second Contract)	300,000	Newport (Mon.)	250,000
Halifax	1,000,000	York	750,000	Tokio, Japan	1,000,000
Toronto	250,000	Rochester	500,000	Pernambuco, Brazil	125,000
Ottawa	250,000	Kingston, Ont.	300,000	Malton	150,000
Lindsay (Remodelled)	125,000	Crystal Palace District	2,000,000	Duluth, Minn. (Second Cont.)	300,000
Montreal	500,000	Duluth, Minn.	300,000	Brockville, Ont.	250,000
Toronto (Second Contract, Remodelled)	2,000,000	Caterham	150,000	Smethwick	500,000
Belleville	250,000	Leicester	2,000,000	Gravesend	300,000
Ottawa (Second Contract)	250,000	Enschede, Holland	150,000	Newport (Mon.) (Second Cont.)	250,000
Brantford (Remodelled)	200,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Third Contract)	750,000
		Burnley	1,500,000	Toronto (Fourth Contract)	1,000,000
		Kingston-on-Thames	1,750,000	Montreal, Ont. (Second Cont.)	1,800,000
		Accrington	500,000	Hamilton, Ont.	400,000

Leeds, 1,800,000 C. Ft. Leicester (Second Contract), 1,000,000 C. Ft. Newcastle-on-Tyne, 1,800,000 C. Ft.

And, in addition, 8,150,000 Cubic Feet daily; also Coal-Gas Plants at Nelson, B.C., Chatham, Berlin, Napanee, Owen Sound, Calgary, and Winnipeg.

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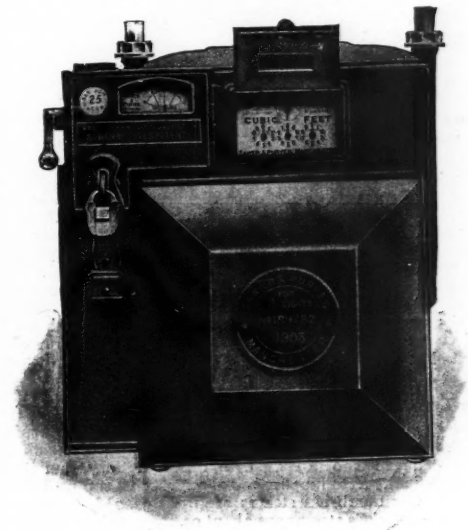

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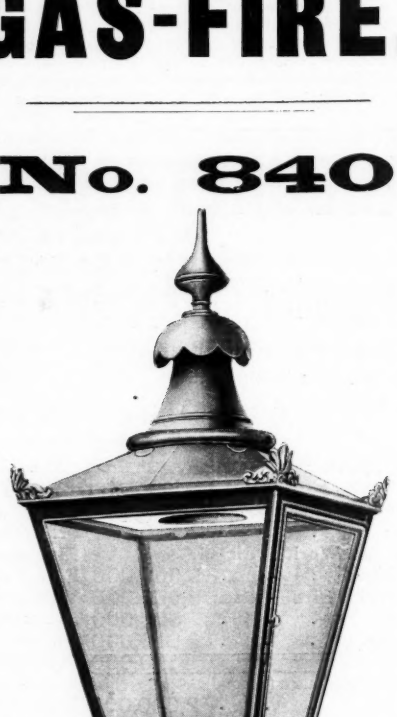

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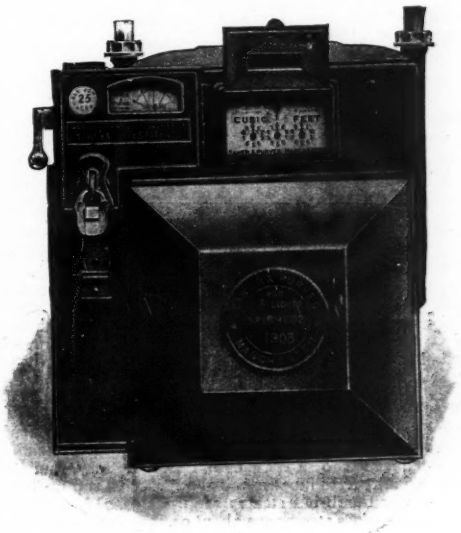

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most refiners decline to offer for immediate delivery. In creosote, the market is easy. Business has been done in Yorkshire at 1½d. for delivery all over the present year, and there appears to be certainly more offering for both prompt and forward delivery. In London, there is no business of importance to advise; but there are still sellers of salty oil at 1⅝d. for prompt delivery. In pitch, so far as London is concerned, the market is very dull indeed, and there is practically no business doing; but in South Wales the demand is fairly good for both prompt and forward delivery. It is quite evident that business in briquettes is likely to be brisk for some time to come. Continental consumers do not take any interest in the market for early delivery, and, so far as forward is concerned, they appear quite content to wait a little before contracting—evidently believing that prices will be easier forward. The general position of anthracene remains the same. There is nothing whatever doing for either prompt or forward delivery.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 32s. to 32s. 6d.; east coast, 30s. to 30s. 6d.; west coast, 29s. 6d. to 30s. Benzol, 90 per cent., 10d.; 50-90 per cent., 10½d. to 10¾d. Toluol, 1s. Crude naphtha, 4½d.; solvent naphtha, 1s. to 1s. 1d.; heavy naphtha, 11½d. to 1s. Creosote, London, 1⅝d.; North, 1 7/16d. to 1 11/16d. Heavy oils, 2½d. Carbolic acid, 60 per cent., 1s. 9½d. Refined naphthalene, £5 to £9 10s.; salts, 23s. to 26s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

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COAL TRADE REPORTS.

Lancashire Coal Trade.

The late severe weather at sea has interfered somewhat with coal shipments on the Manchester Ship Canal; but during the past week freights in waiting have been loaded freely, and something like normal conditions have prevailed. The general trend of trade shows no practical alteration from a week ago. Gas coal and cannel still meet with a fair inquiry, though the tendency is to a less total quantity for consumption. House coal is only in moderate request. Engine fuel and coal for forge and steam purposes are in steady demand. Slack is scarce; and furnace coke is in fair request. The Pemberton coal strike, which has dragged on an uninteresting existence for the last six months, seems likely to be brought to a conclusion through the kindly offices of a conference between the miners' and owners' representatives and a couple of Members of Parliament. There is no change to report in the quotations given in our last issue.

Northern Coal Trade.

There has been ease in the coal trade of the North, due, in some measure, to the selling by merchants who had bought ahead. Prices have in consequence shown some ease, especially for steam coals; but should the difficulty as to labour abroad approach a rupture, prices may react. Best Northumbrian steams are from 9s. 7½d. to 9s. 10½d. per ton f.o.b., second-class steams are about 9s. to 9s. 3d., and steam smalls are firm at 6s. In the gas coal trade, the home demand now shows some decrease; and the deliveries are less on the large southern contracts. Prices, however, are very firm—Durham gas coals varying from 8s. 6d. to 9s. 9d. per ton f.o.b., according to contract. Tenders are now in the market for several towns in Northern Europe; and for one of the chief of these—for about 110,000 tons delivered over the season—it is said that from 9d. to 1s. per ton above the prices of last year is likely to be the basis of the quotations that are being made. Some days, however, will elapse before the result is known. The large British contracts are expected to be soon in the market. As to coke, the price is firm; and this has its influence on gas coke, the supply of which is now rather less. There are variations in values; but good gas coke has been quoted on the Newcastle Exchange of late at about 11s. per ton f.o.b.

Scotch Coal Trade.

There is no change to report. Outputs are being freely disposed of, and prices are being well maintained. The prices quoted are: Main 7s. 9d. to 8s. per ton f.o.b. Glasgow, ell 9s. to 9s. 6d., and splint 9s. 9d. to 10s. The shipments for the week amounted to 257,340 tons—an increase of 30,927 tons upon the previous week, but a decrease of 6222 tons upon the same week of last year. For the year to date, the total shipments have been 778,971 tons—an increase of 73,779 tons upon the corresponding period of 1905.

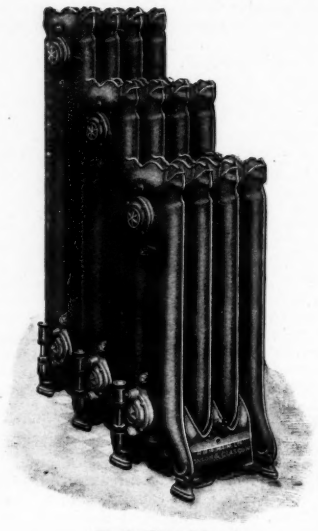
A Water Scheme for Clare (Suffolk).—Particulars of a water scheme for Clare (Suffolk) were given at a Local Government Board inquiry by the Engineer (Mr. H. H. Sands), who said that a borehole had already been sunk to a depth of 250 feet. This was lined with 8¼-inch steel tubes to a depth of 161 feet; while water rose to within 91 feet from the surface. During tests extending over fourteen days 3250 gallons of water per hour were pumped; the level of the water being only reduced 3 ft. 3 in. throughout the test. It is proposed to fix a 6½-inch tube well-pump in the borehole. This will lift 3200 gallons per hour, and would be worked by an oil-engine, supplemented by a wind-engine. There will be a concrete covered brick reservoir, of a capacity of 65,000 gallons. The total cost of the works is estimated at £3650.

THE "MAIN"

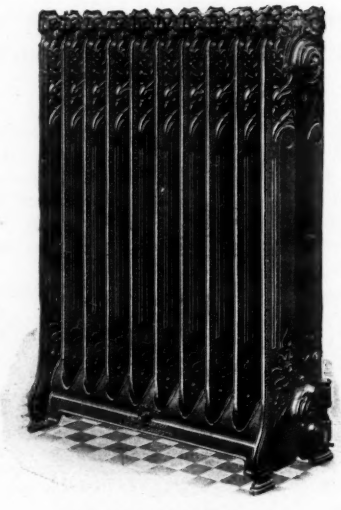
"ST. MUNGO"

Gas-heated

STEAM RADIATORS.



Plain Design.



Ornamental Design.

FITTED WITH EVERY MODERN IMPROVEMENT

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R. & A. MAIN, LTD.,

LONDON, GLASGOW, & FALKIRK.

Failure of Light in a Nottingham Church.—Owing, it is stated, to an overflow of water into the gas-pipes, the lights in the Woodborough Road Baptist Chapel, Nottingham, failed last Sunday week. The building is lighted on the high-pressure incandescent system; and the failure occurred while a hymn was being sung. The congregation were not alarmed, and the provision of a number of tapers allowed the service to be concluded and the people to find their way out.

The Penny-in-the-Slot System in Manchester.—The extent to which penny-in-the-slot gas-meters are used in Manchester was illustrated strikingly last Friday by the weight of copper collected. In monetary value, the pennies amounted to £195, and they weighed 8½ cwt. A fact not perhaps generally known is that 50 pennies equal 1 lb. in weight. This mass of copper was collected in one day; and it created a "penny-in-the-slot record." The number of slot meters in use in the Gas Department's area is about 50,000.

Strange Occurrence with a Gas-Stove in Liverpool.—On Tuesday evening when the employees of a bag manufacturing firm in Liverpool were leaving work, they noticed that the Manager, Mr. Walter Lake, was in his office; and on the place being opened the following morning, he was found unconscious on the floor, the office being full of gas. There was a gas-stove in the room, the tap of which was turned on, though it was not lighted. Mr. Lake died on Friday. It is presumed that he must have fallen off his stool in a fainting fit.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards placed two new issues of capital by order of Directors. The first was £13,500 of 4 per cent. perpetual debenture stock of the Southend Gas Company, which was all sold at from £103 5s. to £104 10s. per £100; the second consisted of 400 additional ordinary £10 shares in the Lowestoft Water and Gas Company, which realized £11 5s. to £11 10s. per share. On the same occasion, Mr. Richards sold £1000 of 4 per cent. perpetual debenture stock for the Directors of the latter Company, at £105 10s. per £100. Messrs. Tilley and Parry offered for sale at auction recently, in lots of £100 each, £5000 of 6 per cent. preference stock in the Chippenham Gas Company. This stock is part of the additional capital authorized to be issued under the Company's Act of 1904; and the proceeds are to be utilized in the erection of new works and the purchase of machinery. The stock realized from £120 to £123 per £100.

Dover Gas-Works Recreation Room.—The eighteenth anniversary of the opening of this room was celebrated by a concert last Tuesday; the function having been postponed from the 12th of December owing the death of a member. The President (Mr. Raphael Herring, the Engineer of the Dover Gas Company) occupied the chair; and he was supported by Mr. Willsher Mannering, the Chairman of the Company, who, with his usual generosity, had defrayed all the expenses. Mr. Mannering opened the proceedings with a few sympathetic references to departed friends—including Mr. Worsfold Mowll, whose father was Chairman of the Company for about thirteen years—and then expressed his pleasure at meeting the employees again, and the thanks of the Company for the way in which they had worked for them. The programme drawn up for the occasion consisted of songs and recitations, ventriloquism, a phonograph and gramophone competition, and conjuring tricks; and it was excellently carried through. The healths of the President and Mr. Mannering were enthusiastically drunk; the Hon. Secretary (Mr. H. Harman) and the Chairman of Committees (Mr. T. Pybus) were thanked for the valuable assistance they had rendered; and a most enjoyable evening was brought to a close with the singing of the National Anthem.

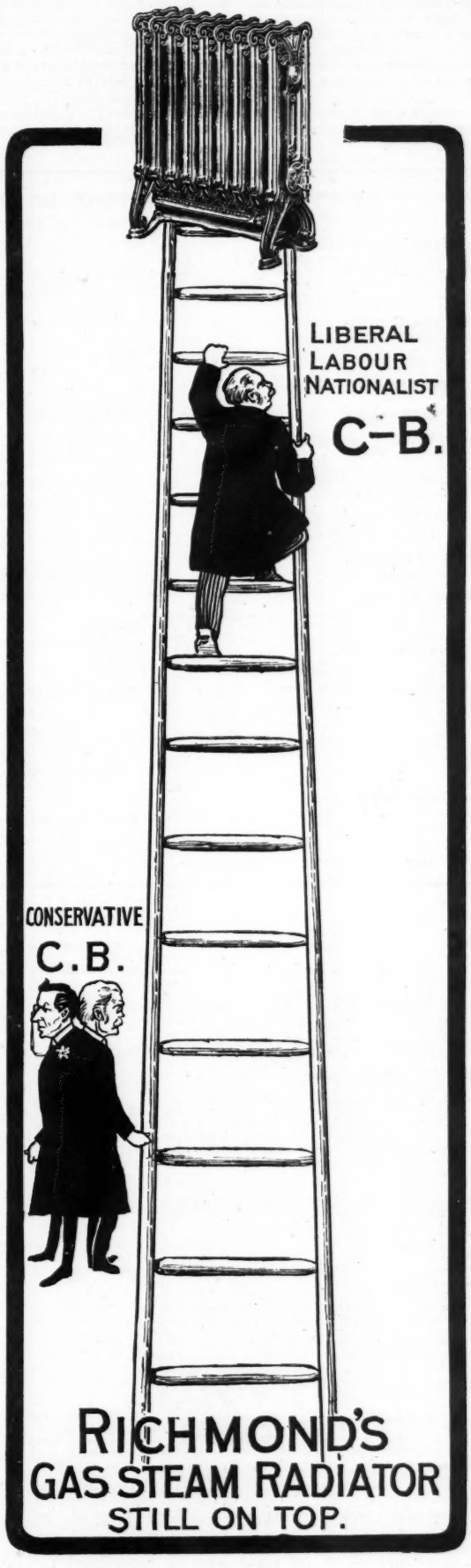
At the meeting of the Oldbury District Council last Friday, it was decided, on the recommendation of the Gas Committee, that the charge for gas for purposes other than cooking, heating, and lighting, should be reduced to 1s. 6d. per 1000 cubic feet, as from the next reading of the meters.

The Hankon Light and Power Company, Limited, has been registered with a capital of £20,100, in 2000 ordinary shares of £10 each and 2000 deferred shares of 1s. each, to carry on the business of electrical, mechanical, and chemical engineers, producers and suppliers of light, heat, sound, and power by electricity, galvanism, magnetism, or otherwise.

Messrs. Thomas Piggott and Co., Limited, of Birmingham, have recently secured orders for 20 pressed steel standard tanks for Buenos Ayres; a riveted steel chimney, 6 feet in diameter and 125 feet high; a pit-head frame for South Wales; pressed culvert pipes, 36 inches in diameter, for South Africa; and some riveted rectangular flues for the Newcastle Power Station.

Messrs. Edgar Allen and Co., Limited, of Sheffield, have just secured a contract from the Bolsover Collieries, Limited, for the supply of a complete coal-screening plant, including five bar and four plate picking-belts, fitted with lowering gears throughout, together with all necessary shoots, &c.; also for five structural buildings in which to fix the plant. They have likewise been favoured with instructions from the Burton-on-Trent Corporation to proceed with an order for conveying and elevating plant.

The Commercial Intelligence Branch of the Board of Trade have been notified by His Majesty's Consul at Gothenburg that tenders are invited by the Lund Town Water-Works for the supply of about 2000 metres of cast-iron faucet pipes of 305 mm. inside diameter, and not less than 13 mm. thickness of material. Further particulars, conditions, &c., may be obtained from the water-works office at Lund. There has also been received from the Acting British Consul-General at Christiania a translation of a notice calling for tenders for the supply of water-pipes to the Namsos Water-Works. The pipes required are cast-iron socket-pipes, dipped and guaranteed for 20 atmospheres pressure. The Acting Consul-General adds that he is not aware of any regulations in regard to this contract which limit competition to Norwegian firms, or which require tenders to be sent in by agents residing in Norway.



Advertisement of the Richmond Gas Stove and Meter Co., Ltd.

London: 132, Queen Victoria St. Offices and Works: Warrington.

The report of the Directors of the National Gas-Engine Company, Limited, for the year ended the 31st of December, states that the net profit, after deducting depreciation on buildings, tools, &c., and allowing for trade expenses and management salaries, is £40,014. After providing interim dividends on the preference and ordinary shares, and adding £2566 brought forward, the Directors propose to pay a final dividend at the rate of 15 per cent. per annum for the six months, and a bonus of 1s. per share, on the ordinary shares; leaving a balance of £16,403. Out of this, they suggest that they should place £10,000 to the reserve fund (making it £60,000), write off £635 for expenses and stamp duties attendant on the increase of capital to £400,000, and carry forward £5767.

We have received from Messrs. Percival Marshall and Co. a pamphlet bearing the title of "Electrical Power: What It Is, and What It Can Do," by Mr. A. W. Marshall, M.I.Mech.E., &c. The author furnishes a simple explanation of the subject for business men and householders. The matter is divided into four sections. In the first he shows that everybody wants power; and, being a consulting electrical engineer, he naturally suggests that it is the power in which he is specially interested. He then shows what it can do, how to obtain it, and how to understand it. His remarks on these matters are written in a light, easy style; and they are followed by an explanation of every-day electrical terms, which those for whom the booklet is primarily intended will no doubt find useful.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
LONDON REPRESENTATIVE. No. 4551.
CHIEF DRAUGHTSMAN. No. 4543.
TRAVELLERS (COAL AND CANNEL). No. 4544.
FOREMAN FITTER. Waterford Gas Company.

Situations Wanted.
WORKING MANAGER. Dickson, Iron Bridge, Salop.
INSPECTOR. DISTRIBUTING DEPARTMENT, &c. No. 4554.
SECRETARY OR ACCOUNTANT. No. 4555.

Pupil (Vacancy for). No. 4553.

Books (Second-Hand) for Sale. No. 4538.

Plant (Second-Hand) for Sale.
ENGINE AND EXHAUSTER, CONDENSERS, MOUTHPIECES, DIP, &c., PIPES, HYDRAULIC MAIN, BOILERS. Newton Ayr Gas Company.
STATION METER. Redditch Gas Company.

Chemical Manufacturing Works.
SALE BY AUCTION. Gaunt, Widnes. Feb. 20.

Patent for Disposal.
GAS LIGHTING BY ELECTRICITY. Abel, Vienna.

Company Meetings.
BARNET GAS AND WATER COMPANY. Albion Tavern. Feb. 23. 12.30 o'clock.
BRENTFORD GAS COMPANY. Charing Cross Hotel. Feb. 16. 2.30 o'clock.
BROMLEY GAS CONSUMERS' COMPANY. Bromley. Feb. 20. Six o'clock.
RIDDINGS GAS COMPANY. London Office. Feb. 23. Three o'clock.
SOUTH SUBURBAN GAS COMPANY. Albion Tavern. Feb. 23. Three o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Offices. Feb. 24, Three o'clock.
WEST HAM GAS COMPANY. Liverpool Street Hotel. Feb. 27. 12.30 o'clock.

Stocks and Shares.
AMMAN VALLEY GASLIGHT AND COKE COMPANY, LIMITED.
SUNDERLAND AND SOUTH SHIELDS WATER COMPANY. Feb. 22.
TOTTENHAM AND EDMONTON GAS COMPANY. March 9.

TENDERS FOR

Brass Cocks and Fittings, &c.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
NELSON GAS DEPARTMENT. Tenders by Feb. 21.

Breeze.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Feb. 22.

Coal and Cannel.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Feb. 22.
MILFORD HAVEN GAS DEPARTMENT. Tenders by Feb. 12.
NELSON GAS DEPARTMENT. Tenders by Feb. 21.

Coke.
MILLOM GAS DEPARTMENT.

Conveying and Elevating Machinery, &c.
STOCKPORT GAS DEPARTMENT. Tenders by Feb. 14.

Cookers.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Fire-Clay Goods.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
STOCKPORT GAS DEPARTMENT. Tenders by Feb. 14.
TIPTON GAS DEPARTMENT. Tenders by Feb. 17.
TODMORDEN GAS DEPARTMENT. Tenders by Feb. 17.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by Feb. 14.

General Stores, Ironmongery, &c.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
NELSON GAS DEPARTMENT. Tenders by Feb. 21.

Lime.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Feb. 22.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
SALFORD GAS DEPARTMENT. Tenders by Feb. 15.

Meters.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Oil.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Oxide of Iron.
BIRKENHEAD GAS DEPARTMENT. Tenders by Feb. 8.

Pipes (Wrought and Cast), &c.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
TIPTON GAS DEPARTMENT. Tenders by Feb. 17.

Retort-Benches, Ironwork, &c.
STOCKPORT GAS DEPARTMENT. Tenders by Feb. 14.

Retort Setting (*see also* Fire-Clay Goods).
TODMORDEN GAS DEPARTMENT. Tenders by Feb. 17.

Sulphate of Ammonia.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Feb. 22.

Sulphuric Acid.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by Feb. 22.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.

Tar and Liquor.
BARROW-IN-FURNESS GAS DEPARTMENT. Tenders by Feb. 20.
NELSON GAS DEPARTMENT. Tenders by Feb. 21.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 340.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	Nov. 15	7	Bombay, Ltd.. . . .	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅛	..	5 1 10
50,000	10	Aug. 31	14	Bourne- mouth Gas & Water } 10 p.c. . .	29—30	..	4 13 4
51,810	10	,,	7	B 7 p.c. .	17—18	..	3 17 9
53,200	10	,,	6	Pref. 6 p.c.	15¼—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	263—268	+3	4 13 3
300,000	,,	,,	9½	Do. New . . .	197—202	..	4 14 1
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,750	,,	Dec. 14	4	Do. 4 p.c. Deb. .	101—104	..	3 16 11
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	223—228	..	4 18 9
246,320	,,	,,	8½	Do. A. Ord. Stk. .	162—167	..	4 18 10
460,000	20	Sept. 28	10	British	43—44	+½	4 10 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c. .	121—124	..	4 16 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	91—94	..	4 15 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12⅞—13	+⅛	5 7 8
250,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
150,000	20	July 13	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.. .	10—10⅝	..	4 5 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	Dec. 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,443,280	Stk.	Aug. 31	5⅝	Commercial 4 p.c Stk. .	117—119	..	4 7 4
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—115	..	4 6 11
475,000	,,	Dec. 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	128—133	..	4 17 9
200,000	,,	,,	7	Do. 7 p c Pref.	143—148	..	4 14 7
424,070	Stk.	—	5½	Derby Con. Stk. . . .	125—127	..	4 6 8
55,000	,,	—	4	Do. Deb. Stk. . . .	108—110	..	3 12 9
486,090	10	Jan. 25	11	European, Ltd. . . .	22⅛—23⅛*	+⅛	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	16—17*	..	4 17 0
15,223,235	Stk.	Aug. 16	4⅛	Gas- light and Coke } 4 p.c. Ord. . .	100⅛—101½	−1	4 6 9
2,600,000	,,	,,	3½	3½ p.c. max. . .	89—91	..	3 16 11
3,799,735	,,	,,	4	4 p.c. Con. Pref.	110—112	..	3 11 5
4,193,975	,,	Dec. 14	3	3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	101—103	..	4 17 1
82,500	,,	,,	6⅔	Do. do. 5 p.c.	123—126	..	5 3 2
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	20—21	..	5 4 9
3,800,000	Stk.	Nov. 15	10	Imperial Continental .	238—240	+3	4 3 4
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	123—128	..	4 13 9
561,000	Stk.	Aug. 16	10	Liverpool United A . .	239—241	+2	4 3 0
718,100	Stk.	Aug. 16	7	Liverpool United B .	167—169	−¾	4 2 10
306,083	,,	Dec. 29	4	L'rpool Unit'd Deb. Stk.	109—111	..	3 12 1
75,000	5	Dec. 14	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 2	5	Met. of 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	Nov. 15	3½	Monte Video, Ltd. . .	11⅛—12½	..	5 12 0
1,565,892	Stk.	July 29	4⅝	Newc'tle & G'tesh'd Con.	107—109	..	4 4 10
406,625	Stk.	Dec. 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20	+½	5 0 0
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	148—151	..	5 6 0
600,000	5	Sept. 14	7	Ottoman, Ltd. . . .	6—6½	..	5 7 8
398,490	5	Apl. 28	6	Primitiva Ord. . . .	7—7½	..	4 0 0
796,980	5	Jan. 25	5	Do. 5 p.c. Pref. .	5½—5½*	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	98—100	+1	4 0 0
851,070	10	Oct. 13	7	River Plate Ord. . . .	12⅝—13¼	..	5 5 8
300,000	Stk.	Dec. 29	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
250,000	10	Sept. 28	7	San Paulo, Ltd. . . .	13—13⅛	..	5 3 8
70,000	50	Jan. 2	5	Do. 5 p.c. Deb. .	50—52	..	4 16 2
135,000	Stk.	Sept. 14	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,498	,,	,,	10	Do. C	244—246	..	4 1 4
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	110—120	..	4 11 8
70,000	10	Sept. 28	10	South African	16—17	+½	5 17 8
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	130—132	..	4 3 4
1,895,445	,,	Jan. 11	3	Do. 3 p.c. Deb.	86—88	..	3 8 2
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—132	..	3 15 9
112,533	,,	Jan. 11	5	Do. 5 p.c. Deb. Stk.	132—137	+2	3 13 0
502,310	Stk.	Nov. 15	5	Southampton Ord. . . .	109—112	..	4 9 3
120,000	Stk.	Aug. 31	6¼	Tottenham A 5 p.c. .	125—128	..	4 17 8
363,020	,,	,,	4½	and B 3½ p.c. .	99—102	..	4 13 2
125,000	,,	Dec. 14	4	Edmonton 4 p.c. Deb.	105—107	..	3 14 9
182,380	10	Dec. 29	8	Tuscan, Ltd.	9½—10	..	8 0 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
30,000	Stk.	Aug. 16	7½	Wands- worth A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	and B 3½ p.c. . .	137—140	..	4 9 3
60,000	,,	,,	5½	C 3½ p.c. . .	113—116	..	4 13 6
57,564	,,	Dec. 29	3	Putney 3 p.c. Deb. Stk.	82—85	+2	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord.	105—107	..	4 13 6
185,000	,,	,,	5	Do. 5 p.c. Pref. .	123—126	..	3 19 4
193,300	,,	Dec. 29	4	Do. 4 p.c. Deb. Stk.	102—107	..	3 14 9

Prices marked * are "Ex. div."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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GAS PURIFICATION & CHEMICAL CO., LD.
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.
JOHN E. WILLIAMS AND CO.,
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BROTHERTON & CO., LIMITED.
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Correspondence invited.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.**
Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAZINE—A radical Solvent and Preventative of Naphthalene deposits, which has been used for many years on the Continent for the cleaning of Mains and Services, and is now being adopted in England. It is also used for the Enrichment of Gas, and has an Illuminating Value of double that of 90 per cent. Benzol.
Supplied by C. BOURNE, 120, Manor House Road, NEWCASTLE-ON-TYNE.

GAS OILS.
MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 8, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

TAR AND LIQUOR WANTED.
Best Prices paid.
DENT AND CO.,
Ouse Chemical Works, SELBY.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
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SPENT OXIDE PURCHASED IN ANY DISTRICT

THE First Dutch Bogore Co., Ltd.,
HOLLAND.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.
THE Water and Gas Debenture Share
Investment Trust, Limited, of 37, High Street, Tunbridge Wells, are prepared to Invest £10,000 Capital in above, and also to Underwrite Progressive Water and Gas Companies' issues.

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

ADVERTISEMENT No. 4541.
THE Directors beg to notify the 147 Applicants that this position HAS BEEN FILLED by Mr. L. J. C. GEER, of SEVENOAKS.

ADVERTISER seeks Situation as WORKING MANAGER on small Works. Understands whole routine of Works. Thoroughly Practical Fitter, internal and external. Good References.
Address W. H. DICKER, Hill Side, Iron Bridge, SALOP.

A GENTLEMAN who has had Twenty Years' Experience (for Six Years Secretary) in the office of a large and important Water Undertaking, is open to Re-Engagement as SECRETARY or ACCOUNTANT. Excellent Testimonials and References can be furnished.
For full Particulars, address No. 4555, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER seeks Situation as INSPECTOR in Distribution Department. Thoroughly Experienced in Control of Workmen, Automatic Installations, every description of Incandescent Lighting, and Main and Service Laying. Capable of Taking Charge of Show-Rooms, &c. Testimonials.
Address No. 4554, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two or Three Travellers to sell Coal and Cannel. Must be well known to Gas Managers. State District known in, and full Particulars as to previous employment. Payment by Salary or Commission, or both.
Address No. 4544, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIEF Draughtsman required immediately by a Firm manufacturing Gasholders, Gas-Works Plant, Chemical Plant, and Constructional Steel Work of all descriptions. Must be capable of making his own Calculations of Strength, &c., and of Designing new work. Fine opening for a clever, capable man, with good powers of Organization and Control over his Staff.
All Applications will be considered in strict confidence, and should state Age, Salary expected, &c., and when at liberty.
Apply, by letter, to No. 4543, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

OXIDE OF IRON.
(NATURAL.)
BALE & CHURCH will be pleased to send Quotations and Samples on application.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT for all Retort and Furnace work.
PAINT for Gasholders, Purifiers, &c.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, & MESSEL, LTD.
(with which is amalgamated WM. PEARCE & SONS, LTD.),
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone 341, AVENUE.

THE Engineer of a Gas Undertaking in the Midlands has a VACANCY for a PUPIL.
Address No. 4553, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF WATERFORD GAS COMPANY.
FOREMAN Fitter wanted to Superintend Outdoor Fitters' Work and Interview and Advise Consumers. Must be well up in Interior House Fitting, including Cookers, Heaters, Geysers, &c., Main and Servicing, and all kinds of Incandescent Lighting, Public and Private. Good opening for a Smart, Intelligent, and Capable Man, five men having already vacated this position to become Gas Managers. Wages £2 per week.
Apply, in own hand-writing, stating Experience, Age, &c., to Mr. J. G. TOOMS, Manager, Gas-Works, WATERFORD.

LONDON Representative—Wanted, a Gentleman with Good Connection among leading Consulting Engineers, Foreign Merchants, and Buyers to REPRESENT a First-Class Firm of Gas and General Constructional Engineers who are on Admiralty and other Government Lists. One with Practical Knowledge, able to Advise Clients and discuss technical points preferred. Applications will be treated with strict confidence, and should state Age and Salary required.
Apply, by letter, in first instance, to No. 4551, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Gas Meters, Obsolete, Wets or Drys, for Cash.
ROSSE WORKS, Leeds Road, BRADFORD.

WANTED to Purchase, Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than Four Tons.
State Price to No. 4512, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REDDITCH GAS COMPANY.
STATION Meter for Sale. Handsome design. Perfect Condition. Capacity, 11,200 feet per hour. Cheap to immediate purchaser.
ALBERT E. LAYTON,
Manager.

GAS Lighting by Electricity—The English and American Patents for new Improvements on Apparatus for Lighting Gas by Electricity for SALE, price £500.
Specimen, Description, and copy of Letters Patent, on application to KARL ABEL, Lichtensteinstr. 12, Vienna, IX, AUSTRIA.

SECOND-HAND Plant for Sale by the Newton Ayr Gas Company—
1 STEAM ENGINE and EXHAUSTER, 10,000 cubic feet per hour.
1 Set of 8-inch CONDENSERS—Twelve double rows of 8-inch Pipes.
38 RETORT MOUTHPIECES, 22 in. by 15 in. by 6 in., faucets, with duplicate doors and Screwed Cross-heads for each.
38 DIP, BRIDGE, and STAND PIPES.
9 9 ft. 6 in. lengths of D-Steel HYDRAULIC MAIN, 20 in. by 18 in. each, 9 ft. 6 in. in length, made for 7-inch dips.
1 CORNISH BOILER, 13 ft. by 5 ft., with Mountings complete.
2 Egg-end BOILERS, 15 ft. by 4 ft.
Will be Sold Cheap. Particulars from the Manager, J. GIBB.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BOOKS on Gas for Sale.—Sugg's Gas Manipulation; Matthew's History of Gas Lighting; F. W. Hartley's Gas Analyst's Manual; F. W. Hartley's Gas Measurement; F. W. Hartley's Estimation of Ammonia and Sulphur; Paterson's Lithology of Gas Coal; Gas Purification, by R. H. Patterson; Dibdin's Practical Photometry; Stevenson's Modern Appliances in Gas Manufacture; The Gas Manager in the Laboratory; Reports of Gas Institute, 1870-1904; Reports of Gas Managers' Meetings, 1883-1900. Inquiry Solicited.
Address No. 4538, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

URBAN DISTRICT COUNCIL OF MILLOM
(GAS DEPARTMENT)

INVITE Offers for 150 Tons of Gas Coke delivered into Trucks at Millom Railway Station.
By order,
A. J. JACKSON,
Manager.

Gas-Works, Millom,
Feb. 1, 1906.

TO CHEMICAL MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the purchase and removal of about 250 Tons of SPENT OXIDE OF IRON now lying at the Gas-Works.
Forms of Tender and Samples may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.
Tenders, sealed and endorsed "Tender for Spent Oxide of Iron," to be sent in to me not later than Five p.m. on Thursday, the 8th of February, 1906.
The Corporation do not bind themselves to accept the highest or any Tender.
By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
Jan. 26, 1906.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the supply of Machine-Moulded FIRE-CLAY RETORTS, FIRE-BRICKS, CAST-IRON PIPES, WROUGHT-IRON TUBES and FITTINGS, BRASS COCKS, GAS-METERS, GAS-COOKERS, OIL, LIME, IRONMONGERY AND SULPHURIC ACID, as may be required from the 1st day of April next to the 31st day of March, 1907.
Sealed Tenders, on Forms to be obtained at the Office of the Manager of the Gas and Water Works, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Stores," to be delivered at the Town Clerk's Office on or before Tuesday, the 20th of February, 1906.
The lowest or any Tender not necessarily accepted.
By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the purchase of the surplus GAS TAR and OIL-GAS TAR produced at their Gas-Works from the 1st day of April next to the 31st day of March, 1907, delivered into the Purchaser's Tank-Waggons at the Gas-Works Siding.
Any further Information may be had on application to the Manager of the Gas-Works.
Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office on or before Tuesday, the 20th day of February, 1906.
The highest or any Tender not necessarily accepted.
By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply and Erection of INCLINED-RETORT BENCHES, together with Sixteen Furnaces and Settings complete with all Ironwork, Coal-Hoppers, Coal Elevating and Conveying Plant, and Hot-Coke Conveying and Storing Plant.
Plans, Specifications, and full Particulars can be obtained on application to the Engineer, Mr. S. Meunier, Portwood Gas-Works, Stockport, on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.
Tenders, sealed and endorsed "Inclined-Retort Benches," must be delivered to the Town Clerk's Office, Stockport, addressed to the Chairman of the Gas Committee, on or before the 14th of February next ensuing.
No Tender will be accepted without satisfactory proof that the Firm Tendering pays the Trade Union rate of wages, and observes the Trade Union number of hours as are usually paid and observed in the district where the goods are made or produced.
By order,
ROBERT HYDE,
Town Clerk.

Stockport, Jan. 26, 1906.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company invite TENDERS for the supply and delivery of FIRE-CLAY GOODS at their Gas-Works.
Specification and Form of Tender may be had on application to the undersigned.
Sealed Tenders, endorsed "Retorts," to be sent in to W. H. Welsh, Esq., 52, Brown Street, Manchester, not later than Feb. 14, 1906.
The Directors do not bind themselves to accept the lowest or any Tender.
WM. SEVERS,
Engineer and Manager.

Gas-Works, Wilmslow,
Jan. 31, 1906.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of about 900 Tons of LIME required for the Purification of Gas at their respective Stations during the Twelve Months from the 1st of April, 1906.
Full Particulars may be obtained on application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Lime," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 15th of February, 1906.
By order,
L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Feb. 1, 1906.

ASHFORD (KENT) URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS are invited for any of the undermentioned GOODS during the Year ending March 31, 1907.
For the supply of 60 Tons Best SULPHURIC ACID.
" " 100 Tons of LIME for Purification.
" " 7500 Tons of GAS COAL.
For the PURCHASE of the BREEZE and SULPHATE OF AMMONIA made on the Council's Gas-Works, Ashford, Kent.
BREEZE, about 350 Tons.
SULPHATE OF AMMONIA, about 60 Tons.
Further Particulars and Form of Tender can be obtained from the undersigned, to whom all Tenders must be delivered on or before Thursday, Feb. 22, 1906.
JOHN MORTON,
Manager.

Feb. 1, 1906.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS AND STEAM COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for about 850 Tons of Large GAS COAL, and about 350 Tons of Bituminous STEAM COAL, to be delivered between the 1st of April, 1906, and the 31st of March, 1907; the whole of the Coal to be fresh hewn, clean, and free from all Impurities.
Further Particulars and Forms of Tender can be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tenders for Gas and Steam Coal," addressed to the Chairman, Gas and Water Works Committee, to be sent in not later than the 12th of February next.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
THOMAS H. LEWIS,
Clerk.

Milford Haven,
Jan. 30, 1906.

BOROUGH OF NELSON.

SUPPLY OF GENERAL REQUIREMENTS AND SALE OF SURPLUS TAR.

THE Gas Committee invite Tenders for the supply of the following Requirements during the Twelve Months ending the 31st of March, 1907—
(*a*)—GAS COAL.
(*b*)—GENERAL IRONMONGERY.
(*c*)—BRASS FITTINGS.
The Committee also invite TENDERS for the Purchase of the Surplus TAR produced at their Nelson and Brierfield Works during the Twelve Months ending the 31st of March, 1907.
Form of Tender for each item, together with full Particulars, may be obtained on application to Mr. A. J. Hope, Gas-Works, Leeds Road, Nelson.
Sealed Tenders, duly endorsed, must be sent to the undersigned not later than Wednesday, the 21st of February, 1906.
J. H. BALDWICK,
Town Clerk.

TIPTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR FIRE-CLAY GOODS AND TUBES.

THE Gas Committee invite Tenders for the supply of—
(*a*)—FIRE-CLAY GOODS,
(*b*)—WROUGHT IRON TUBES and FITTINGS,
which may be required during the ensuing Twelve Months.
Forms of Tender for Fire-Clay Goods and any further Particulars can be obtained on application to the undersigned.
No Tender Forms are issued for Tubes.
Tenders, endorsed "Tender for Fire-Clay Goods" and "Tender for Tubes" respectively, to be addressed to the Chairman of the Gas Committee, Gas-Works, Tipton, on or before Feb. 17, 1906.
SIDNEY O. STEPHENSON,
Engineer and Manager.

Gas-Works, Tipton,
Feb. 2, 1906.

TODMORDEN CORPORATION.
(GAS DEPARTMENT.)

TO RETORT AND FIRE-BRICK MANUFACTURERS, &c.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of the necessary RETORTS, FIRE-BRICKS, &c., also the RETORT SETTING, required for the Year ending March 31, 1907.
Full Particulars and Form of Tender may be had on application to the Engineer and Manager, Mr. Hy. Talbot.
Tenders, endorsed "Retorts, &c.," to be delivered at the Town Clerk's Office, Town Hall, Todmorden, addressed to the Chairman of the Gas Committee, on or before the 17th inst.
The Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept a portion of any Tender.
By order,
HENRY TALBOT,
Engineer and Manager.

Feb. 2, 1906.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 23rd day of February, 1906, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect Two Directors and One Auditor in the place of those retiring by rotation, and for General purposes.
Notice is Hereby Given, that an EXTRAORDINARY MEETING of the Proprietors of the South Suburban Gas Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 23rd day of February next, at 3.30 o'clock in the afternoon, or as soon thereafter as the business of the Ordinary Meeting of the Proprietors shall be concluded, for the purpose of considering the provisions of the Bill now before Parliament, intituled "A Bill to make further provisions with respect to the gas supplied by the South Suburban Gas Company, and the price to be charged therefor and for other purposes."
At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.
Dated this 9th day of February, 1906.
The TRANSFER BOOKS WILL BE CLOSED from the 9th day of February until after the Meeting.
By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Jan. 26, 1906.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 639, High Road, Tottenham, on Saturday, the 24th day of February, at Three o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half-Year ended the 31st of December last; to declare Dividends, and to transact General Business.
The TRANSFER BOOKS for the CONSOLIDATED "A" and "B" STOCKS WILL BE CLOSED from Friday the 9th to Monday the 26th day of February, both days inclusive.
NOTICE IS HEREBY ALSO GIVEN, that at 3.30 o'clock in the afternoon, or so soon thereafter as the Business of the Ordinary Meeting shall have been concluded, and pursuant to the Standing Orders of both Houses of Parliament, an EXTRAORDINARY MEETING of the Proprietors will be held for the purpose of considering the Provisions of the Bill now before Parliament, intituled "A Bill to confer further powers upon the Tottenham and Edmonton Gaslight and Coke Company, and for other purposes." At such Meeting the said Bill will be submitted for the consideration and approval of the Proprietors.
By order,
JAMES RANDALL,
Secretary.

Chief Offices: 639, High Road,
Tottenham, Feb. 2, 1906.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 23rd day of February, 1906, at Half-past Twelve o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor, in the place of those retiring by rotation, and to transact the General Business of the Company.
The TRANSFER BOOKS WILL BE CLOSED from the 10th to the 23rd of February, both inclusive.
AND NOTICE IS HEREBY GIVEN, that an EXTRAORDINARY GENERAL MEETING of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 23rd day of February, 1906, immediately on the conclusion of the business of the Ordinary General Meeting to be held on the same day, for the purpose of considering, and, if deemed expedient, passing, a resolution sanctioning the creation and issue, under the Barnet District Gas and Water Acts, 1872, 1883, and 1887, of £87,350 Debenture Stock, bearing Interest at the rate of 4 per cent. per annum, and the disposal of such Stock in such manner at such times and on such terms as the resolution may provide.
By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, Feb. 2, 1906.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Charing Cross Hotel, on Friday, the 16th of February inst., at Half-past Two o'clock precisely, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such meeting go out of office, in compliance with the Company's Acts of Parliament.

By order.
WILLIAM MANN,
Secretary.

Office, Brentford,
Feb. 1, 1906.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Tuesday, the 20th day of February, 1906, at Six o'clock p.m. precisely, to receive the Report of the Directors, with the Balance-Sheet certified by the Auditors, to declare a Dividend, to elect Two Directors and an Auditor on retirements by rotation, to raise further Capital, to authorize the issue thereof, and to transact generally the business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 3rd of February to the 20th of February, both days inclusive.

By order of the Board.
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, Feb. 3, 1906.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of this Company will be held at the Abercorn Rooms, Liverpool Street Hotel, E.C. (Bishopsgate Street entrance), on Tuesday, the 27th day of February, 1906, at 12.30 p.m. o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ending the 31st of December, 1905, to declare a Dividend, to elect Two Directors and an Auditor in the place of those retiring by rotation, and for other General Business.

The TRANSFER BOOKS of the Company, so far as they relate to Consolidated Ordinary and Preference Stocks, WILL BE CLOSED from the 14th to the 27th of February, both days inclusive.

By order of the Board,
A. G. SNELGROVE,
Secretary.

Gas-Works, Stratford, E.,
Feb. 3, 1906.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Friday, the 23rd day of February, 1906, at Half-past Three o'clock in the afternoon, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 10th to the 23rd inst., both inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, Feb. 3, 1906.

WIDNES.

By order of THEO. S. SHEARD, Esq., the Receiver appointed Pursuant to an Order of the Court in the Chancery of the County Palatine of Lancaster, Liverpool District, in the matter of The Chemical Manufacturing Company, Limited, "The Marsh," Widnes.

MR. GEORGE GAUNT has received Instructions to SELL BY AUCTION, on Tuesday, February 20, at the Works, commencing at Two o'clock,

THE CHEMICAL MANUFACTURING WORKS, with the valuable Modern Machinery, Plant, and Accessories contained therein, and pertaining to the said Chemical Manufacture.

FIRST AS A WHOLE, or as a GOING CONCERN, subject to the Conditions of Sale to be then and there produced, when, if not so disposed of, then,

LOT 2—The Extensive Timber Constructed Buildings and Offices, together with Steam Boiler and Shafting; when, if so disposed of, then,

LOT 3—All Metal Tanks and Vats.

LOT 4—All Wood Tanks.

LOT 5—The 34-Horse Power National Gas-Engine and all other detailed Machinery other than contained in Lot 2.

To be viewed on Saturday and Monday, February 17 and 19, when Catalogues, containing the Additional Particulars of Terms and Conditions of Tenancy, &c., may be had at the Works; also from T. S. SHEARD, Esq., Chartered Accountant, 13, Harrington Street; from Messrs. KELLY, PICTON, AND RILEY, Solicitors, 15, Lord Street; or from the AUCTIONEER, 25, Lord Street, all of LIVERPOOL. Telephone 5536.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for
METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £25,000 "B" ADDITIONAL CONSOLIDATED STOCK.

MINIMUM PRICE, £102 PER CENT.

IN pursuance of the Tottenham and Edmonton Gas Act, 1898, NOTICE IS HEREBY GIVEN, that it is the intention of the Directors of this Company to SELL BY TENDER £25,000 of the above CONSOLIDATED STOCK, to be paid up in full on or before the 23rd day of March next; such stock being a portion of Additional Capital authorized to be raised by resolution passed at an Extraordinary General Meeting of Proprietors held on the 20th of February, 1904, under the powers of the above-mentioned Act.

Particulars and Conditions, with Form of Tender, may be obtained on application at this Office; and Sealed Tenders must be sent in not later than Four o'clock on Friday, the 9th of March, 1906.

By order of the Board,
JAMES RANDALL,
Secretary.

Chief Offices: 639, High Road,
Tottenham, Feb. 2, 1906.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER STOCK.

TO BE SOLD by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Feb. 22, 1906, at Two o'clock in the Afternoon prompt,

MR. ATKINSON GIBSON, AUCTIONEER,

£20,000

(Nominal) of Additional ORDINARY CAPITAL STOCK (Maximum Dividend Five per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891.

The above Stock will be entitled to Dividend from the 1st day of January, 1906, and be registered in the name of the Purchaser free of charge.

A deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1906.

GAS LAMPS,
REFLECTING LANTERNS, &c.
S. SHERMAN & SON,
WEST CENTRAL GAS LANTERN WORKS
HEAD OFFICE:
57, NEW COMPTON ST., W.C.
CATALOGUE (Just Printed) ON APPLICATION.
Telephone: 4939 Gerrard.
Telegrams: "Illuminate, London."

MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
Please apply for Prices, Analyses, and Reports, to the
MIRFIELD (GAS COAL) COLLIERIES
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 22, Park Village East, N.W.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

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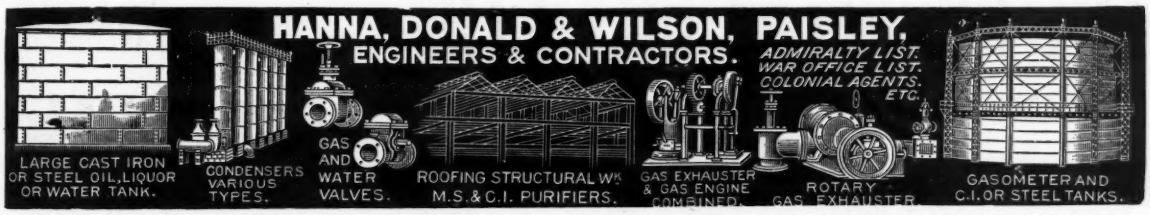
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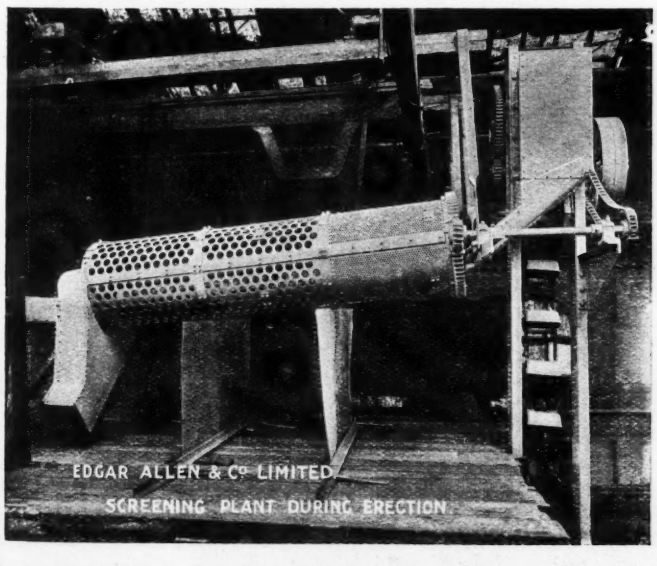

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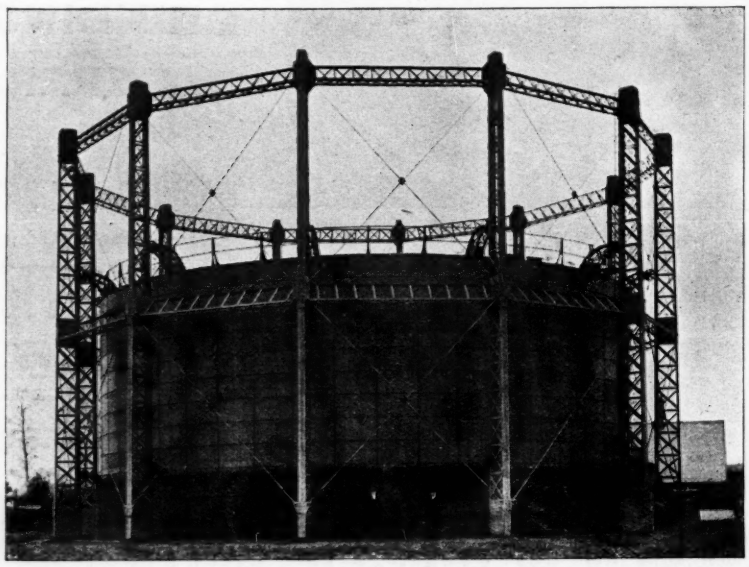

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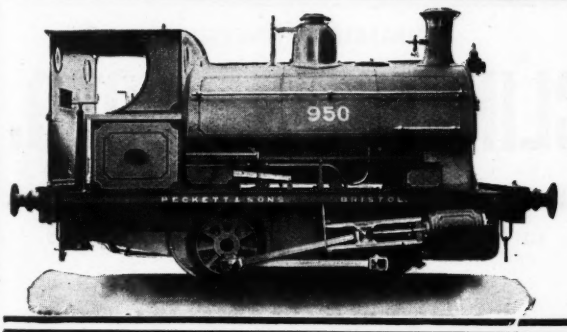

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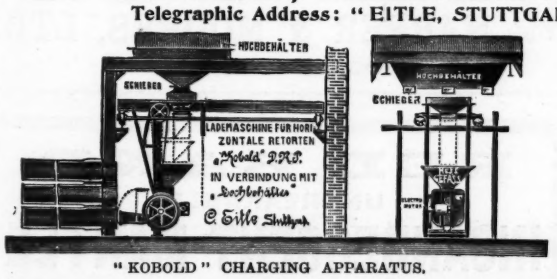

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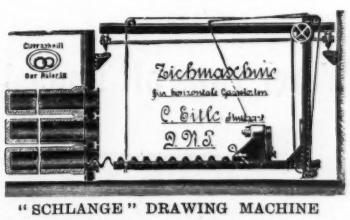

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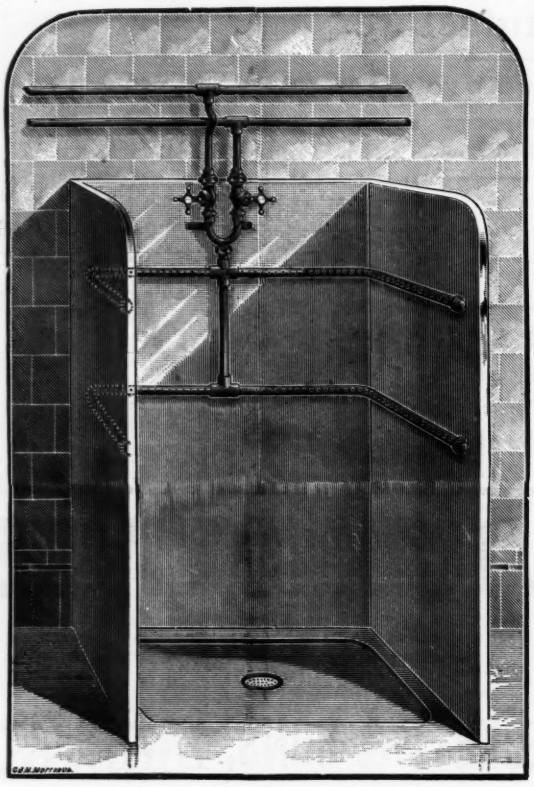

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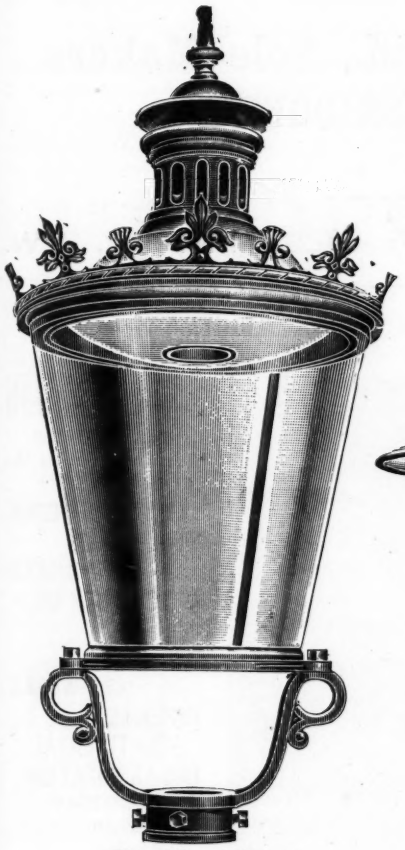
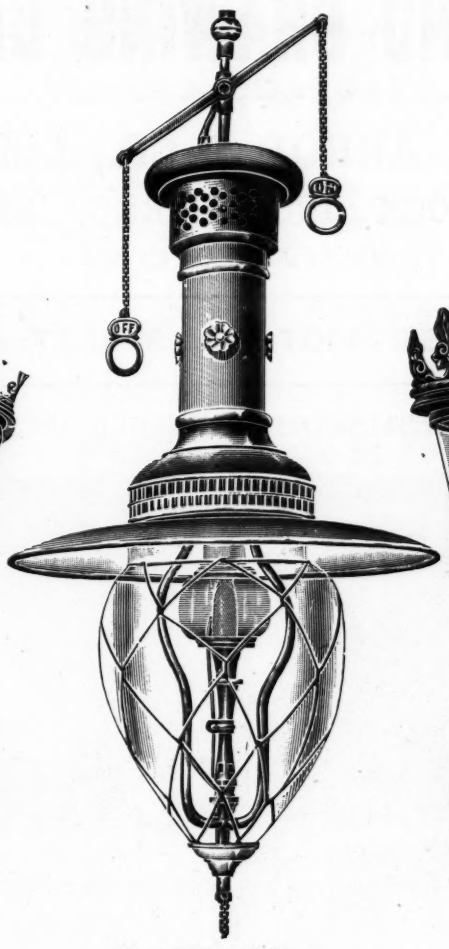


Fig. 35. 100 c.p.



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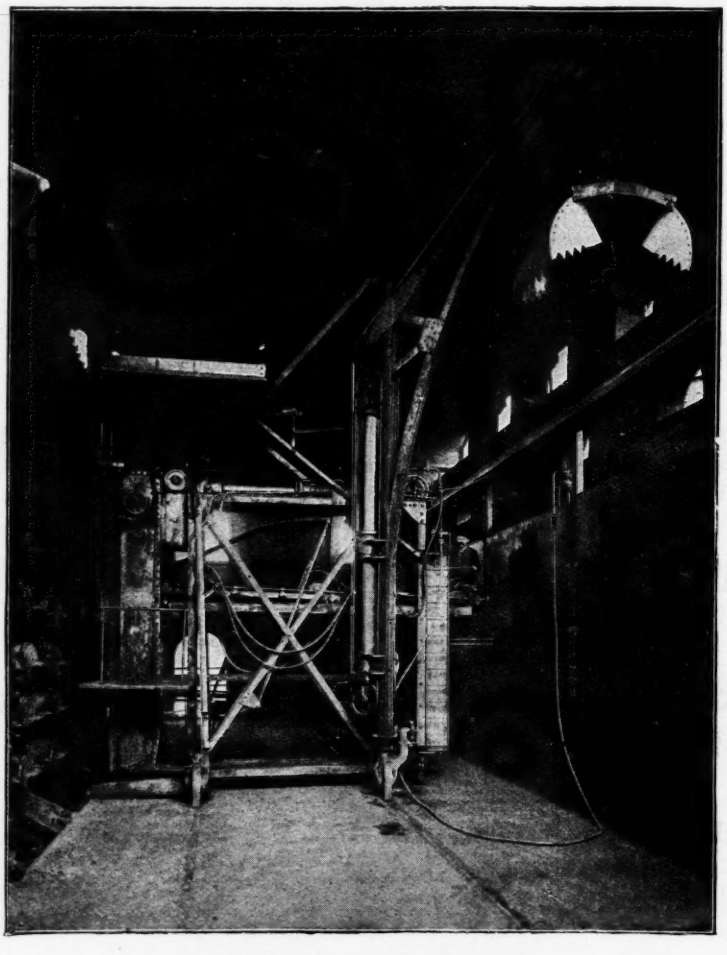

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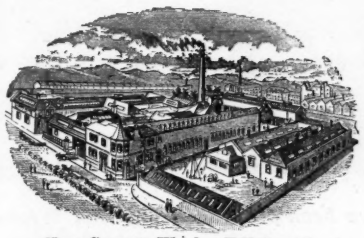

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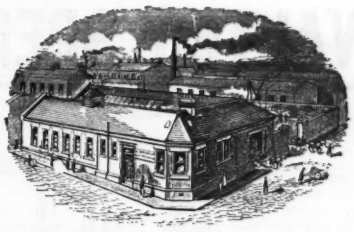

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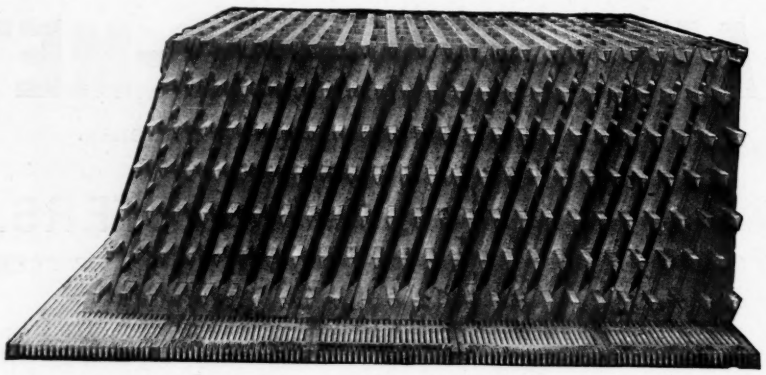

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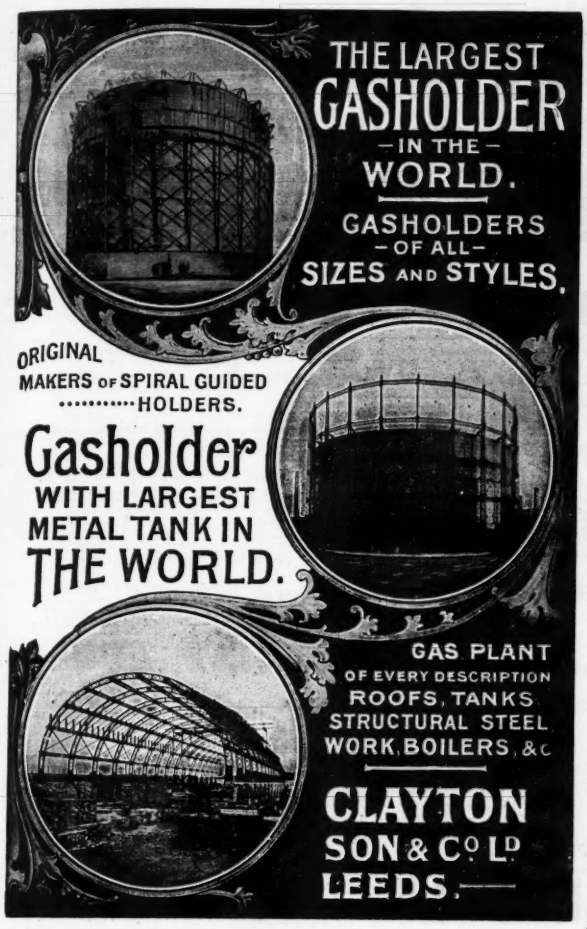

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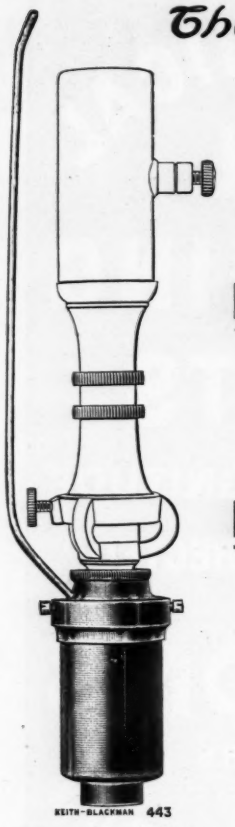

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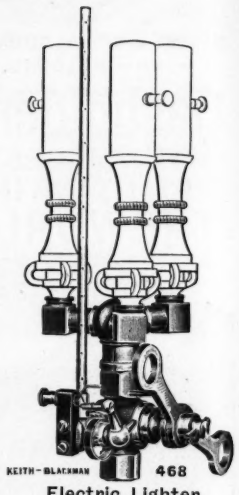

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